Submitted to:
San Luis Obispo County
October 16, 2015

FINAL INVESTMENT GRADE ASSESSMENT REPORT
for
San Luis Obispo County

PG&E Sustainable Solutions Turnkey (SST) Program

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1.0 EXECUTIVE SUMMARY

Pacific Gas & Electric (PG&E) presents San Luis Obispo County with this Sustainable Solutions Turnkey (SST) Investment Grade Assessment (IGA). Our team has focused on confirming the economic viability of implementing a comprehensive and integrated project through the SST Program that includes energy efficiency and operational/infrastructure upgrades that support the County's energy, sustainability, and long-term infrastructure goals.

Through collaboration and feedback from the County over the past several months, the scope of the IGA focuses on eleven (11) main County facilities local to the downtown areas as well as energy management control systems upgrades at many smaller facilities throughout the entire County. The results of this IGA clearly demonstrate that the County can in fact benefit from the SST program and that it would bring long-term economic, environmental, and infrastructure benefits to San Luis Obispo County. Our assessment identifies a variety of opportunities that can be bundled into a fully-funded project.

1.1 Investment Grade Assessment (IGA) Project Goals

To improve energy efficiency, decrease operating costs, and reduce its Green House Gas (GHG) emissions, San Luis Obispo County has engaged the PG&E SST team to analyze the feasibility of implementing a turnkey, design-build energy efficiency, retrofit project utilizing PG&E's Sustainable Solutions Turnkey (SST) program.

The IGA process began in November 2013 with several meetings and conference calls that included key project stakeholders, County personnel, PG&E, and AECOM, which resulted in a set of key project goals.

- Identify economically viable projects that when implemented will help the County meet its energy and sustainability goals.
- Upgrade aging systems/equipment to improve operational efficiency resulting in reduced operating costs.
- Procure the maximum available PG&E incentives.
- Replace the energy inefficient HVAC and control systems with new smarter and more energy efficient systems.

- Pursue and investigate PG&E's On Bill Financing (OBF) option
- Pursue and investigate funding options through the California Energy Commission (CEC)

1.2 Summary of IGA Findings

During the IGA, our team interviewed County staff, reviewed design drawings and system operational data, and performed site energy audits to gain an understanding of the facilities considered as part of this study. Our efforts focused on identifying the most cost effective Energy Conservation Measures (ECMs) that would enable San Luis Obispo County to realize the goals outlined for this IGA. *Table 1.1- Comprehensive ECM Summary Table* provides a menu of all viable ECMs identified through the IGA field survey efforts. *Table 1.2 – Recommended ECM Summary Table* provides a summary of the recommended ECMs for implementation and associated applicable funding sources, as determined through discussions with the County.

1.3 Key Project Benefits

The project for implementation consisting of the recommended ECMs presented in this report, not only meet the original goals identified for this IGA, but when implemented will also provide a variety of other benefits to the County. Some of these key benefits include the following:

- Total project cost of $4,527,159
- Project saves $334,473 per year in energy and operational savings.
- Total project simple payback of 13.3 years
- The project has an SIR of 1.64 (64% return on investment over the projects 20 year life cycle) and creates a net present value of $2,874,852 to the County over a 20 year horizon.
- Annual carbon offset exceeding 686.8 metric tons of CO_2 per year, or the equivalent of removing 151 passenger vehicles from the road per year, or 31,545 trees planted per year.
- Replacement and/or upgrade of critical systems that have reached the end of their useful economic life.
- Significant improvement in overall facility operations.
- Effective leveraging of available grant and incentive programs.

1.4 Next Steps

The ECMs identified in this report will provide the County solutions that, if implemented, will meet or exceed the goals identified for this project. After receiving your feedback, we have finalized this report to include Guaranteed Maximum Pricing for the package of ECMs the County has recommended. As such, this report can be used to begin the next phase of this project, implementation via a design build contract. We look forward to collaborating closely with San Luis Obispo County to deliver a comprehensive project.

1.5 Thank You

The PG&E team expresses our gratitude to the San Luis Obispo County team for coordinating our efforts and sharing the valuable information necessary for the completion of this assessment.

Table 1-1: Comprehensive ECM Summary Table

ECM ID	Building or Facility	Description	Simple Payback (Includes Incentives and O&M)	Energy Savings			Energy Cost Savings		Operational Savings	Total Savings ($)	Project Costs ($)	Estimated Incentives ($)
				Electric (kWh)	Electric (kW)	Gas (Therms)	Electric ($)	Gas ($)	L & M ($)			
1a	Annex	Lighting Upgrades	9.4	80,273	26.3	-	$ 12,683	$ -	$ 278	$ 12,961	$ 122,128	$ -
1b	Old Government Center	Lighting Upgrades	7.7	119,191	39.6	-	$ 18,832	$ -	$ 3,098	$ 21,930	$ 167,766	$ -
1c	Old Courthouse	Lighting Upgrades	7.0	116,847	38.9	-	$ 18,462	$ -	$ 8,323	$ 26,785	$ 186,950	$ -
1d	New Government Center (Board Chamber)	Lighting Upgrades	6.8	10,000	3.2	-	$ 1,580	$ -	$ 840	$ 2,420	$ 16,557	$ -
1e	Library	Lighting Upgrades	10.7	47,922	11.5	-	$ 7,572	$ -	$ 741	$ 8,313	$ 89,306	$ -
1f	Main Jail	Lighting Upgrades	3.3	386,939	45.7	-	$ 61,136	$ -	$ 10,024	$ 71,161	$ 236,579	$ -
1g	Juvenile Hall	Lighting Upgrades	3.9	115,644	15.9	-	$ 18,272	$ -	$ 9,449	$ 27,720	$ 107,193	$ -
1h	Honor Farm	Lighting Upgrades	3.7	93,313	10.7	-	$ 14,743	$ -	$ 2,065	$ 16,809	$ 62,529	$ -
1i	Health Campus	Lighting Upgrades	7.7	115,815	32.8	-	$ 18,299	$ -	$ 3,477	$ 21,776	$ 167,099	$ -
1j	Health Lab	Lighting Upgrades	6.7	11,376	3.8	-	$ 1,797	$ -	$ 879	$ 2,676	$ 17,839	$ -
1k	Department of Social Services	Lighting Upgrades	9.5	82,611	27.6	-	$ 13,053	$ -	$ 3,146	$ 16,198	$ 153,931	$ -
1l	New Government Center (Balance of Building)	Lighting Upgrades	6.2	140,770	45.4	-	$ 22,242	$ -	$ 11,819	$ 34,061	$ 210,375	$ -
6	Government Center Complex	Central Plant Upgrades	40.0	121,985	-	-	$ 19,274	$ -	$ 23,408	$ 42,681	$ 1,716,554	$ 9,759
2 & 3	Government Center Complex	Variable Flow CHW & HHW	11.2	204,461	-	-	$ 32,305	$ -	$ 6,100	$ 38,405	$ 447,365	$ 16,357
5a	Juvenile Hall	Packaged Unit Replacement	36.0	11,210	7.0	175	$ 1,771	$ 119	$ 1,848	$ 3,738	$ 135,508	$ 1,072
5b	Health Lab	Packaged Unit Replacement	27.2	10,027	1.1	61	$ 1,584	$ 41	$ 977	$ 2,603	$ 71,640	$ 863
7	Health Campus	Central Plant Upgrades	53.6	21,450	-	-	$ 3,389	$ -	$ 9,312	$ 12,701	$ 682,906	$ 1,716
8	New Government Center	Underfloor Air Distribution Upgrades	18.2	45,456	-	464	$ 7,182	$ 316	$ 2,547	$ 10,044	$ 186,752	$ 4,101
9	Library	Pnuematic - DDC Stats	10.7	4,976	-	3,750	$ 786	$ 2,550	$ 635	$ 3,971	$ 46,566	$ 4,148
13a	New & Old Government Center	High Efficiency Transformers	15.8	151,743	17.3	-	$ 23,975	$ -	$ -	$ 23,975	$ 379,672	$ -
13b	Department of Social Services	High Efficiency Transformers	18.0	15,256	1.7	-	$ 2,411	$ -	$ -	$ 2,411	$ 43,391	$ -
13c	Main Jail & Honor Farm	High Efficiency Transformers	17.1	37,858	4.3	-	$ 5,982	$ -	$ -	$ 5,982	$ 102,408	$ -
14	Honor Farm	H&V Unit Replacement	22.6	-	-	2,549	$ -	$ 1,733	$ 820	$ 2,554	$ 60,170	$ 2,549
19	Honor Farm	Kitchen Hood Controls	14.7	45,518	-	-	$ 7,192	$ -	$ -	$ 7,192	$ 109,009	$ 3,641
20a	Department of General Services (160 CPUs)	Personal Computer EMS	(0.2)	32,000	-	-	$ 5,056	$ -	$ -	$ 5,056	$ 1,636	$ 2,400
20b	Planning (212 CPUs)	Personal Computer EMS	(0.2)	42,400	-	-	$ 6,699	$ -	$ -	$ 6,699	$ 2,168	$ 3,180
21A	Various County Buildings	EMCS Expansion	10.9	145,000	-	9,398	$ 22,910	$ 6,390	$ 5,876	$ 35,176	$ 403,320	$ 20,998
Totals			**12.6**	**2,210,042**	**332.9**	**16,397**	**$ 349,187**	**$ 11,150**	**$ 105,661**	**$ 465,998**	**$ 5,927,318**	**$ 70,783**

County Funding Sources	Amount
County Solar & Energy Designation (CSED)	$ 1,000,000
CIP Building Automation (CIPBA)	$ 250,000
CIP Health Agency Cooler (CIPHAC)	$ 70,000
Energy & Water Fund (EWF)	$ 200,000

All Funding Sources	Available
PG&E On-Bill Financing (OBF)	$ 1,000,000
California Energy Commission Financing (CEC)	$ 2,243,306
County Funds (CSED, CIPBA, CIPHAC, EWF)	$ 1,520,000
Totals	$ 4,763,306

Table 1-2: Recommended ECM Summary Table

ECM ID	Building or Facility	Description	Simple Payback (Includes Incentives and O&M)	Energy Savings			Energy Cost Savings		Operational Savings	Total Savings ($)	Project Costs ($)	Include in Funding Payback Calc	Funding Source and Amount			Estimated Incentives ($)
				Electric (kWh)	Electric (kW)	Gas (Therms)	Electric ($)	Gas ($)	L & M ($)				OBF	CEC	County Funds	
1a	Annex	Lighting Upgrades	9.4	80,273	26.3	-	$ 12,683	$ -	$ 278	$ 12,961	$ 122,128	CEC		$ 122,128		$ -
1b	Old Government Center	Lighting Upgrades	7.7	119,191	39.6	-	$ 18,832	$ -	$ 3,098	$ 21,930	$ 167,766	CEC		$ 167,766		$ -
1c	Old Courthouse	Lighting Upgrades	7.0	116,847	38.9	-	$ 18,462	$ -	$ 8,323	$ 26,785	$ 186,950	CEC		$ 186,950		$ -
1d	New Government Center (Board Chamber)	Lighting Upgrades	6.8	10,000	3.2	-	$ 1,580	$ -	$ 840	$ 2,420	$ 16,557	CEC		$ 16,557		$ -
1f	Main Jail	Lighting Upgrades	3.3	386,939	45.7	-	$ 61,136	$ -	$ 10,024	$ 71,161	$ 236,579	CEC		$ 236,579		$ -
1h	Honor Farm	Lighting Upgrades	3.7	93,313	10.7	-	$ 14,743	$ -	$ 2,065	$ 16,809	$ 62,529	CEC		$ 62,529		$ -
1i	Health Campus	Lighting Upgrades	7.7	115,815	32.8	-	$ 18,299	$ -	$ 3,477	$ 21,776	$ 167,099	CEC		$ 167,099		$ -
1j	Health Lab	Lighting Upgrades	6.7	11,376	3.8	-	$ 1,797	$ -	$ 879	$ 2,676	$ 17,839	CEC		$ 17,839		$ -
6	Government Center Complex	Central Plant Upgrades	40.0	121,985	-	-	$ 19,274	$ -	$ 23,408	$ 42,681	$ 1,716,554	CEC		$ 926,791	$ 789,764	$ 9,759
2 & 3	Government Center Complex	Variable Flow CHW & HHW	11.2	204,461	-	-	$ 32,305	$ -	$ 6,100	$ 38,405	$ 447,365	OBF	$ 326,479		$ 120,886	$ 16,357
7	Health Campus	Central Plant Upgrades	53.6	21,450	-	-	$ 3,389	$ -	$ 9,312	$ 12,701	$ 682,906	OBF	$ 33,891		$ 649,015	$ 1,716
8	New Government Center	Underfloor Air Distribution Upgrades	18.2	45,456	-	464	$ 7,182	$ 316	$ 2,547	$ 10,044	$ 186,752	CEC		$ 186,752		$ 4,101
19	Honor Farm	Kitchen Hood Controls	14.7	45,518	-	-	$ 7,192	$ -	$ -	$ 7,192	$ 109,009	CEC		$ 109,009		$ 3,641
20a	Department of General Services (160 CPUs)	Personal Computer EMS	(0.2)	32,000	-	-	$ 5,056	$ -	$ -	$ 5,056	$ 1,636	OBF	$ 1,636			$ 2,400
20b	Planning (212 CPUs)	Personal Computer EMS	(0.2)	42,400	-	-	$ 6,699	$ -	$ -	$ 6,699	$ 2,168	OBF	$ 2,168			$ 3,180
21A	Various County Buildings	EMCS Expansion	10.9	145,000	-	9,398	$ 22,910	$ 6,390	$ 5,876	$ 35,176	$ 403,320	OBF	$ 403,320			$ 20,998
Totals			**13.3**	**1,592,024**	**201.0**	**9,862**	**$ 251,540**	**$ 6,706**	**$ 76,227**	**$ 334,473**	**$ 4,527,159**					**$ 62,152**

County Funding Sources	Amount
County Solar & Energy Designation (CSED)	$ 1,039,664
CIP Building Automation (CIPBA)	$ 250,000
CIP Health Agency Cooler (CIPHAC)	$ 70,000
Energy & Water Fund (EWF)	$ 200,000

All Funding Sources	Available Funding	Total Cost	Total Energy Savings	Simple Payback (Energy Savings Only)
PG&E On-Bill Financing (OBF)	$ 1,000,000	$ 767,495	$ 76,749	10.0 Years
California Energy Commission Financing (CEC)	$ 2,200,000	$ 2,200,000	$ 181,496	12.1 Years
County Funds (CSED, CIPBA, CIPHAC, EWF)	$ 1,559,664	$ 1,559,664	N/A	N/A
Totals	$ 4,759,664	$ 4,527,159	$ 258,246	17.5 Years

2.0 UTILITY ANALYSIS

2.1 Overview

As part of the IGA, the PG&E SST team analyzed the utilities to develop an understanding of the electrical and natural gas energy use and associated costs for the County buildings. The analysis included a general review of all the utilities and a detailed review and analysis for the 8 largest buildings or building compounds affected by this project. In total there are 11 buildings, however there is only one electric meter for the Government Center Complex, which serves the New Government Center, the Old Government Center, the Annex, and the Old Courthouse. Water utilities were not considered in the IGA as water conservation measures are not part of the scope.

The overall utility analysis considered up to four (4) years of electrical and natural gas utility data from 2010 through 2013 for the facilities named above. The data was provided for this report by the County's representative (Water Systems Consulting) and originated from the County's accounting office. The County data received was also checked for accuracy against PG&E interval data, where available. On average over these years, the County used 10,800,000 kWh of electricity and 297,000 therms of natural gas per year. Over that time period, the County has spent an average of $1,700,000 for electricity and about $200,000 for gas per year. The eight buildings or building compounds included for detailed analysis used 7,700,000 kWh or 72% of the annual electrical consumption and 220,000 therms or 78% of the natural gas consumption in 2014, per the County's accounting office. The data used from the County accounting office was cross checked against the interval data received from PG&E and no anomalies were found. The buildings are listed in the Table below.

Table 2 1 County of SLO Buildings Selected for Detailed Study

Site	Area (SF)	Annual Electric Consumption (kWh)	Annual Electric Costs	Annual Natural Gas Consumption (Therms)	Annual Natural Gas Costs	Total Annual Costs
Main Library	23,000	142,289	23,802	-	$ -	$ 23,802
Public Health Laboratory	11,806	216,308	40,893	4,583	$ 5,052	$ 45,945
Juvenile Services	22,783	334,463	46,514	7,047	$ 6,657	$ 53,171
Sheriff - Honor Farm	34,807	468,098	71,049	38,596	$ 32,312	$ 103,360
Dept. of Social Services	57,498	630,609	104,075	7,337	$ 6,887	$ 110,961
Health Campus	116,337	806,367	136,350	13,691	$ 12,072	$ 148,422
Main Jail and Female Jail	46,925	1,613,254	215,411	97,853	$ 54,582	$ 269,993
Government Center	343,550	4,304,223	706,278	52,469	$ 39,745	$ 746,024
Total	656,706	8,515,612	$ 1,344,371	221,576	$ 157,308	$ 1,501,678

The Detailed Utility Analysis for each of these buildings is presented in the following sections.

SLO Library

The Library is located at 995 Palm Street in San Luis Obispo. The library operates six days per week from 10 AM to 7 PM Monday through Thursday and 10 AM to 5 PM on Fridays and Saturdays. The spaces are conditioned by 4 pipe fan coil units in the ceilings with chilled and heating water provided from the central plant at the Government Center. Electricity is provided by PG&E under rate schedule A-10. The Library has a meter that is paid for by the County, as well as a meter that is paid for by the City. What is shown in this report is relative to the County meter only. The annual electric consumption for calendar year 2014 was 142,289 kWh at a cost of $23,802.

Figure 2- 1 shows a summary of the Library's electrical consumption and costs for Calendar Year 2014.

Month	kWh	Cost
Jan-14	11,315	$ 1,430
Feb-14	10,659	$ 1,371
Mar-14	11,739	$ 1,521
Apr-14	11,917	$ 1,534
May-14	12,046	$ 2,218
Jun-14	11,303	$ 2,249
Jul-14	12,314	$ 2,475
Aug-14	12,657	$ 2,525
Sep-14	11,923	$ 2,331
Oct-14	12,577	$ 2,572
Nov-14	12,248	$ 1,940
Dec-14	11,591	$ 1,637
Total	**142,289**	**$ 23,802**

Main Library Electical Consumption and Cost

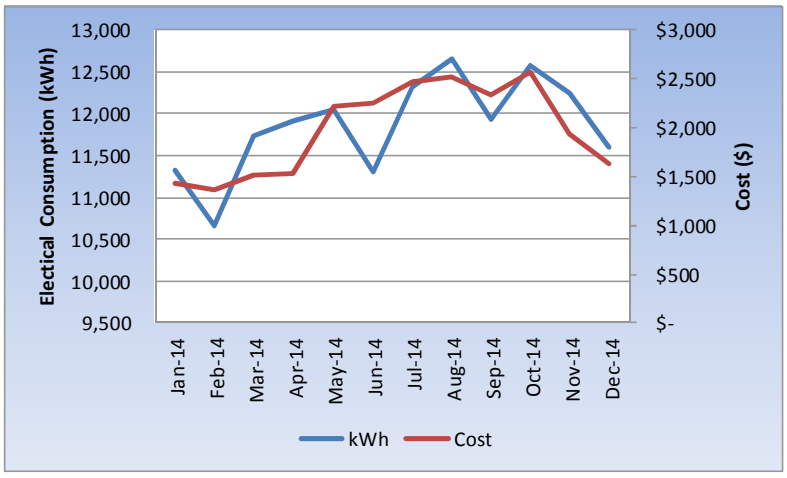


Figure 2-1 Library Electrical Consumption and Costs

Natural gas is not provided to this building as its heating source is hot water from the Government Center Complex.

Public Health Laboratory

The Public Health Laboratory is located at 2191 Johnson Avenue in San Luis Obispo. The building operates as a laboratory for the county Health Agency.

Electricity is provided by PG&E under rate schedule A-10. The annual electric consumption for calendar year 2014 was 216,308 kWh at a cost of $40,893.

Figure 2- 2 shows a summary of the Laboratory's electrical consumption and costs for Calendar Year 2014.

Month	kWh	Cost
Jan-14	17,446	$ 2,538
Feb-14	15,680	$ 2,280
Mar-14	17,980	$ 2,652
Apr-14	17,214	$ 2,574
May-14	19,179	$ 3,717
Jun-14	17,214	$ 3,972
Jul-14	19,241	$ 4,323
Aug-14	20,160	$ 4,282
Sep-14	18,621	$ 4,236
Oct-14	20,106	$ 4,463
Nov-14	17,032	$ 3,194
Dec-14	16,437	$ 2,660
Total	**216,308**	**$ 40,893**

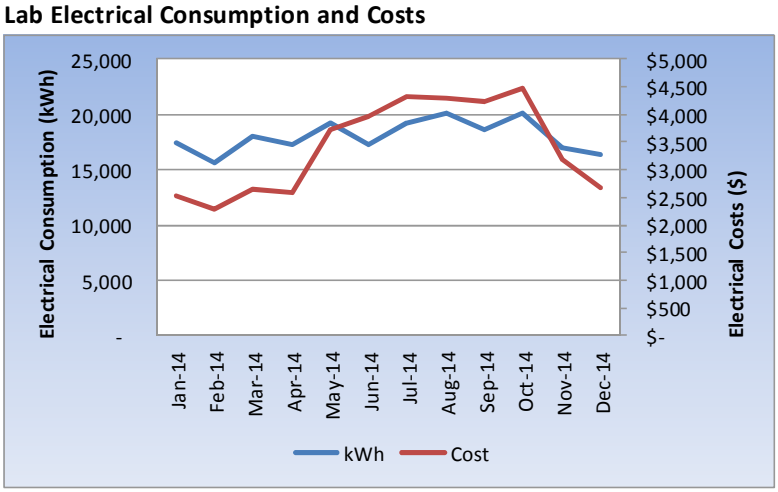


Figure 2-2 Health Laboratory Electrical Consumption and Costs

Natural gas is provided by SoCal Gas. The annual natural gas consumption for calendar year 2014 was 4,583 therms at a cost of $5,052. Figure 2-3 shows a summary of the Laboratory's natural gas consumption and costs for Calendar Year 2014.

Health Lab Natural Gas Consumption and Costs

Month	Therms	Cost
Jan-14	770	$ 776
Feb-14	452	$ 541
Mar-14	603	$ 693
Apr-14	346	$ 408
May-14	326	$ 390
Jun-14	197	$ 246
Jul-14	98	$ 135
Aug-14	167	$ 201
Sep-14	161	$ 192
Oct-14	240	$ 268
Nov-14	611	$ 608
Dec-14	612	$ 593
Total	**4,583**	**$ 5,052**

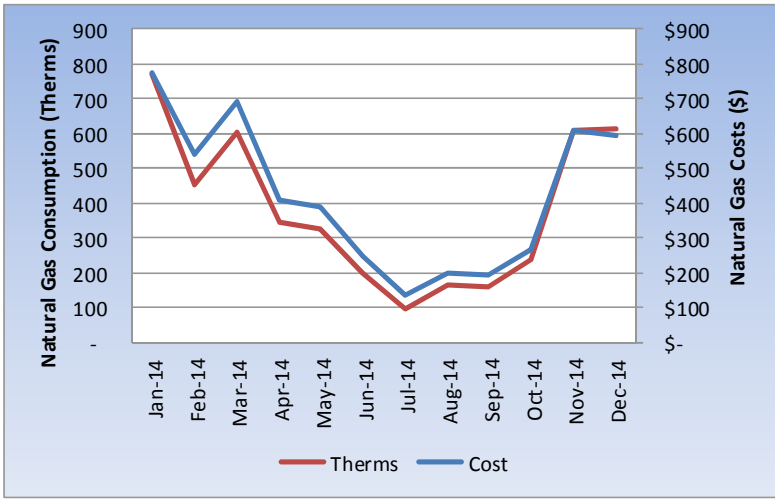


Figure 2-3 Health Laboratory Natural Gas Consumption and Costs

Juvenile Services

The Juvenile Services facility is a jail facility for juvenile offenders. As such, the 22,783 square foot facility operates 24 hours per day, 365 days per year. Electricity is provided by PG&E under rate schedule E-19SV. The annual electric consumption for calendar year 2014 was 334,463 kWh at a cost of $46,514. Figure 2-4 shows a summary of the Juvenile Services Facility's electrical consumption and costs for Calendar Year 2014.

Juvenile Services Electrical Consumption and Costs

Month	kWh	Cost
Jan-14	30,008	$ 3,015
Feb-14	25,721	$ 2,521
Mar-14	27,776	$ 2,701
Apr-14	26,400	$ 2,757
May-14	28,658	$ 5,173
Jun-14	25,875	$ 4,036
Jul-14	28,734	$ 4,786
Aug-14	29,760	$ 4,945
Sep-14	28,335	$ 4,546
Oct-14	30,273	$ 5,691
Nov-14	26,533	$ 3,606
Dec-14	26,389	$ 2,739
Total	**334,463**	**$ 46,514**

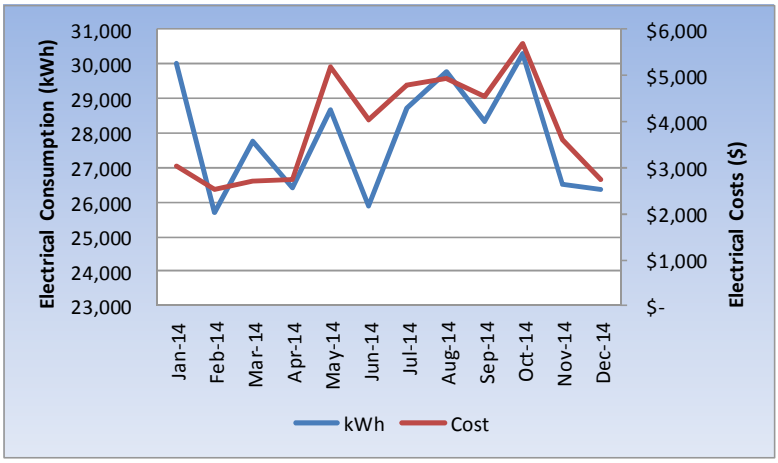


Figure 2-4 Annual Juvenile Services Electrical Consumption and Costs

Natural gas is provided by SoCal Gas. The annual natural gas consumption for calendar year 2014 was 7,047 therms at a cost of $6,657. Figure 2-5 shows a summary of the Facility's natural gas consumption and costs for Calendar Year 2014.

Juvenile Services Natural Gas Consumption and Costs

Month	Therms	Cost
Jan-14	1,138	$ 956
Feb-14	811	$ 747
Mar-14	717	$ 740
Apr-14	805	$ 759
May-14	576	$ 572
Jun-14	473	$ 474
Jul-14	406	$ 425
Aug-14	168	$ 190
Sep-14	312	$ 313
Oct-14	341	$ 342
Nov-14	479	$ 430
Dec-14	821	$ 709
Total	**7,047**	**$ 6,657**

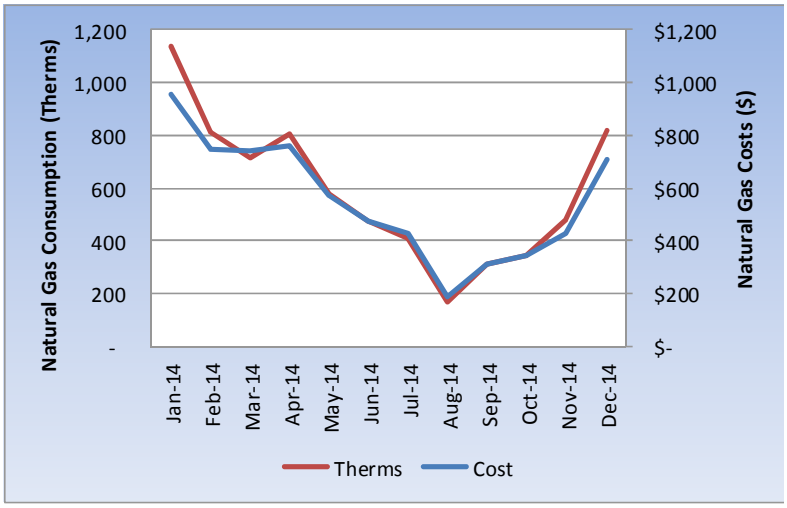


Figure 2-5 Annual Juvenile Services Natural Gas Consumption and Costs

Sheriff –Honor Farm

The Honor Farm is a minimum security detention facility operated by the San Luis Obispo Sheriff's Department. As such, the 34,807 square foot facility operates 24 hours per day, 365 days per year. The kitchen and laundry facilities at the Honor Farm also serve the Main Jail. Electricity is provided by PG&E under rate schedule E-19SV. The annual electric consumption for calendar year 2014 was 468,098 kWh at a cost of $71,049. Figure 2-6 shows a summary of the Facility's electrical consumption and costs for Calendar Year 2014.

Sheriff - Honor Farm Electrical Consumption and Cost

Month	kWh	Cost
Jan-14	28,707	$ 3,143
Feb-14	32,201	$ 3,581
Mar-14	39,187	$ 4,273
Apr-14	35,604	$ 3,912
May-14	38,917	$ 7,290
Jun-14	39,581	$ 6,792
Jul-14	41,028	$ 7,650
Aug-14	34,742	$ 6,658
Sep-14	51,644	$ 8,780
Oct-14	42,323	$ 8,548
Nov-14	39,592	$ 5,481
Dec-14	44,572	$ 4,941
Total	**468,098**	**$ 71,049**

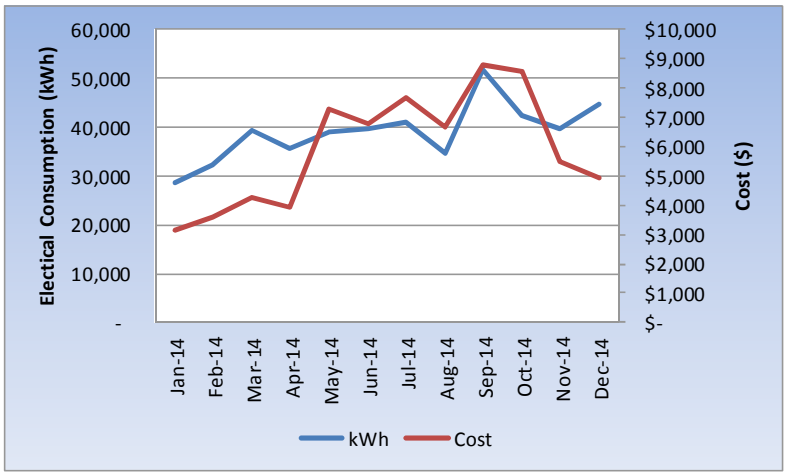


Figure 2-6 Annual Honor Farm Electrical Consumption and Costs

Natural gas is provided to the facility by SoCal Gas. The annual natural gas consumption for calendar year 2014 was 38,596 therms at a cost of

$33,312. Figure 2-7 shows a summary of the facility's natural gas consumption and costs for Calendar Year 2014.

Sheriff - Honor Farm Natural Gas Consumption and Costs

Month	Therms	Cost
Jan-14	4,031	$ 3,213
Feb-14	3,312	$ 2,839
Mar-14	3,172	$ 2,982
Apr-14	3,331	$ 2,889
May-14	3,083	$ 2,695
Jun-14	3,079	$ 2,676
Jul-14	2,964	$ 2,611
Aug-14	2,786	$ 2,302
Sep-14	3,252	$ 2,591
Oct-14	3,013	$ 2,373
Nov-14	2,612	$ 1,996
Dec-14	3,960	$ 3,144
Total	**38,596**	**$ 32,312**

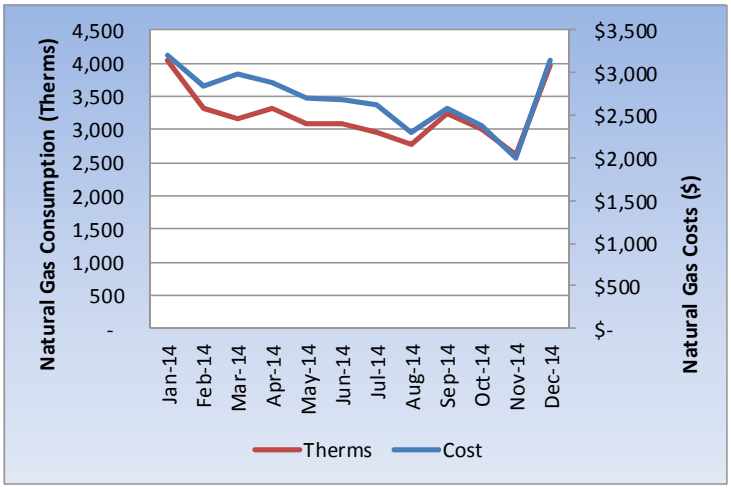


Figure 2-7 Honor Farm Natural Gas Consumption and Costs

Department of Social Services

The Department of Social Services Main Building is located at 3433 South Higuera Street in San Luis Obispo. The facility is a 57,498 square foot office building which operates social programs for the county. Electricity is provided by PG&E under rate schedule A-10SX. The annual electric consumption for calendar year 2014 was 630,609 kWh at a cost of $104,075. Figure 2-8 shows a summary of the Facility's electrical consumption and costs for Calendar Year 2014.

Department of Social Services Electrical Consumption and Cost

Month	kWh	Cost
Jan-14	55,800	$ 6,677
Feb-14	47,214	$ 5,568
Mar-14	52,390	$ 6,086
Apr-14	48,000	$ 5,731
May-14	53,389	$ 9,856
Jun-14	48,484	$ 8,911
Jul-14	53,475	$ 10,075
Aug-14	56,662	$ 14,933
Sep-14	52,993	$ 10,138
Oct-14	58,322	$ 11,814
Nov-14	53,007	$ 7,892
Dec-14	50,873	$ 6,395
Total	**630,609**	**$ 104,075**

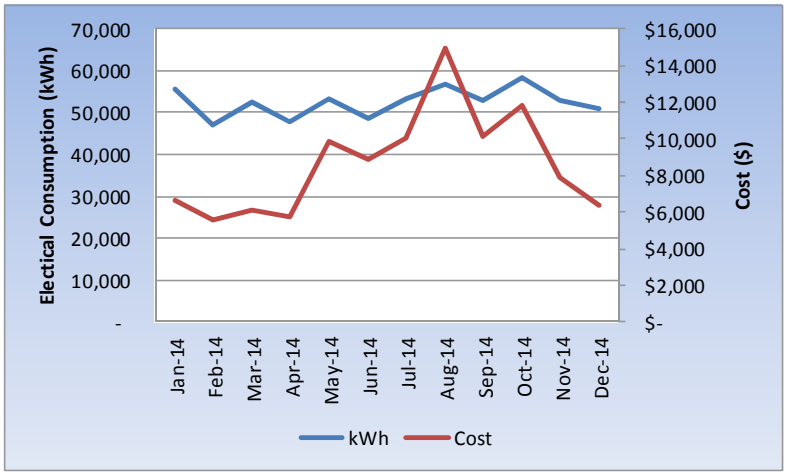


Figure 2-8 Annual Department of Social Services Electrical Consumption and Costs

Natural gas is provided to the facility by SoCal Gas. The annual natural gas consumption for calendar year 2014 was 7,337 therms at a cost of $6,887. Figure 2-9 shows a summary of the facility's natural gas consumption and costs for Calendar Year 2014.

Department of Social Services Natural Gas Consumption and Costs

Month	Therms	Cost
Jan-14	987	$ 883
Feb-14	719	$ 694
Mar-14	779	$ 783
Apr-14	667	$ 634
May-14	563	$ 562
Jun-14	469	$ 470
Jul-14	416	$ 431
Aug-14	368	$ 363
Sep-14	86	$ 102
Oct-14	533	$ 485
Nov-14	720	$ 599
Dec-14	1,032	$ 881
Total	**7,337**	**$ 6,887**

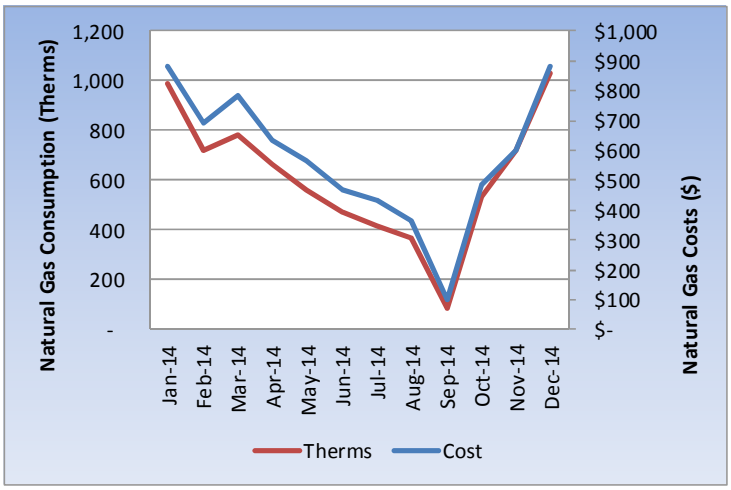


Figure 2-9 Annual Department of Social Services Natural Gas Consumption and Costs

Health Campus

The Health Campus is a compound of buildings located at 2180 Johnson Avenue in San Luis Obispo. The facility operates as a medical and mental health care facility. The buildings in the compound total 116,337 square feet in area, and there are multiple meters. Electricity is provided by PG&E under rate schedules A-1, A-10S E-19SV for the main buildings and LS-1 for the site exterior lighting. The annual electric consumption for calendar year 2014 was 806,367 kWh at a cost of $136,350. Figure 2-10 shows a summary of the Facility's electrical consumption and costs for Calendar Year 2014.

Health Campus Electrical Consumption and Cost

Month	kWh	Cost
Jan-14	61,708	$ 7,587
Feb-14	53,786	$ 6,717
Mar-14	62,246	$ 7,962
Apr-14	69,479	$ 13,030
May-14	64,989	$ 13,987
Jun-14	74,090	$ 14,610
Jul-14	79,191	$ 15,227
Aug-14	76,885	$ 15,139
Sep-14	76,356	$ 15,336
Oct-14	65,853	$ 11,161
Nov-14	59,176	$ 7,648
Dec-14	62,609	$ 7,948
Total	**806,367**	**$ 136,350**

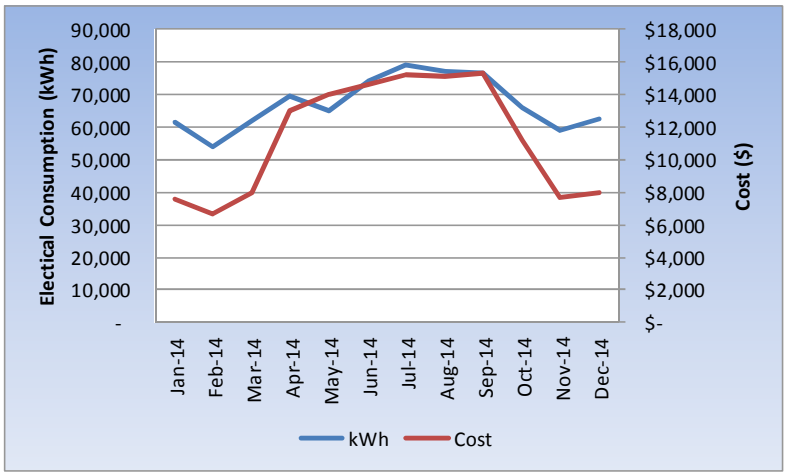


Figure 2-10 Annual Health Campus Electrical Consumption and Cost

Natural gas is provided to the facility by SoCal Gas. The annual natural gas consumption for calendar year 2014 was 13,691 therms at a cost of $12,072. Figure 2-11 shows a summary of the facility's natural gas consumption and costs for Calendar Year 2014.

Health Campus Natural Gas Consumption and Costs

Month	Therms	Cost
Jan-14	2,574	$ 2,028
Feb-14	2,178	$ 1,865
Mar-14	1,480	$ 1,394
Apr-14	1,450	$ 1,346
May-14	960	$ 885
Jun-14	863	$ 806
Jul-14	777	$ 743
Aug-14	690	$ 644
Sep-14	433	$ 414
Oct-14	504	$ 468
Nov-14	456	$ 406
Dec-14	1,325	$ 1,073
Total	**13,691**	**$ 12,072**

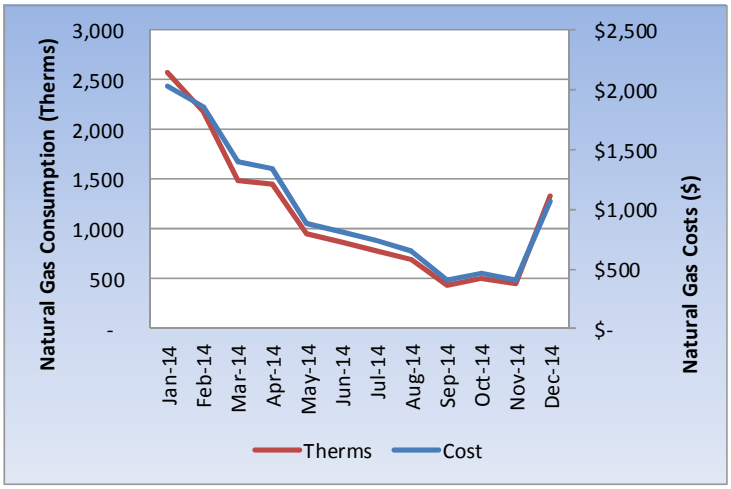


Figure 2-11 Annual Health Campus Natural Gas Consumption and Costs

Main Jail

The Main Jail is the central detention facility for the county. As such, the 46,925 square foot facility operates 24 hours per day, 365 days per year. Electricity is provided by PG&E under rate schedules A-1, A-6, A-10S and E-19SV, due to multiple meters at the site. The total annual electric consumption for calendar year 2014 was 1,613,254 kWh at a

cost of $215,411. Figure 2-12 shows a summary of the Facility's electrical consumption and costs for Calendar Year 2014.

Main Jail Electrical Consumption and Costs

Month	kWh	Cost
Jan-14	136,607	$ 13,523
Feb-14	121,275	$ 11,906
Mar-14	129,741	$ 12,797
Apr-14	124,362	$ 12,387
May-14	135,953	$ 20,885
Jun-14	131,625	$ 20,478
Jul-14	139,588	$ 22,258
Aug-14	150,757	$ 24,311
Sep-14	141,986	$ 22,624
Oct-14	146,583	$ 24,429
Nov-14	121,719	$ 15,684
Dec-14	133,058	$ 14,128
Total	**1,613,254**	**$ 215,411**

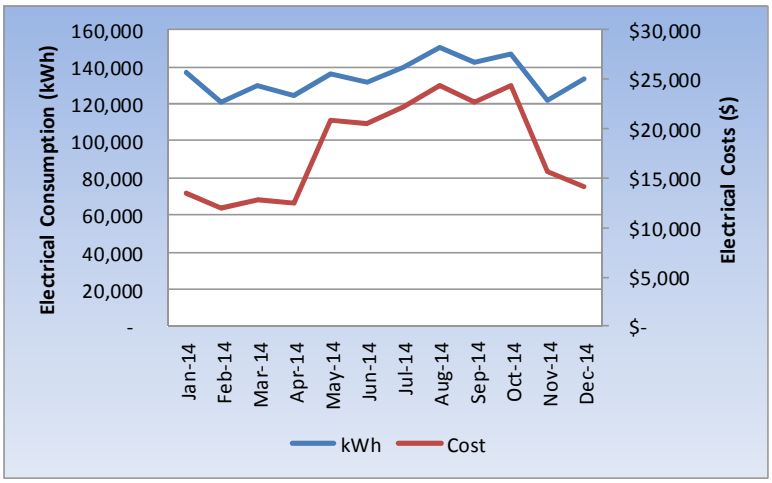


Figure 2-12 Annual Main Jail Electrical Consumption and Costs

Natural gas is provided to the facility by SoCal Gas. The annual natural gas consumption for calendar year 2014 was 97,853 therms at a cost of $54,582. Figure 2-13 shows a summary of the facility's natural gas consumption and costs for Calendar Year 2014.

Main Jail Natural Gas Consumption and Costs

Month	Therms	Cost
Jan-14	18,153	$ 7,304
Feb-14	14,260	$ 6,632
Mar-14	11,837	$ 6,907
Apr-14	12,280	$ 6,390
May-14	8,121	$ 5,100
Jun-14	6,338	$ 4,194
Jul-14	3,011	$ 2,649
Aug-14	3,027	$ 2,497
Sep-14	2,899	$ 2,310
Oct-14	3,161	$ 2,376
Nov-14	3,966	$ 3,009
Dec-14	10,800	$ 5,215
Total	**97,853**	**$ 54,582**

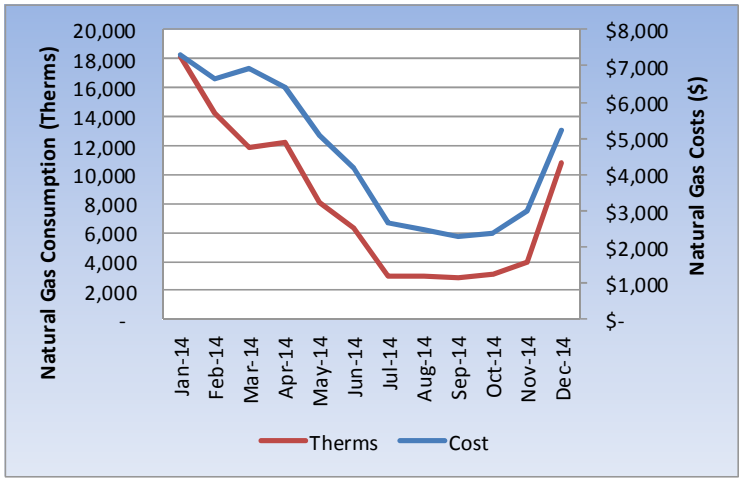


Figure 2-13 Annual Main Jail Natural Gas Consumption and Costs

Government Center Complex

The Government Center Complex is a group of buildings totaling 343,550 square feet. The buildings include the Old Government Center,

the Annex, the Old Courthouse and the New Government Center. Electricity is provided by PG&E under rate schedule E-20P through a single meter for the entire complex. The total annual electric consumption for calendar year 2014 was 4,304,223 kWh at a cost of $706,278. Figure 2-14 shows a summary of the Facility's electrical consumption and costs for Calendar Year 2014.

Government Center Electicity Consumption and Cost

Month	kWh	Cost
Jan-14	329,678	$ 39,818
Feb-14	314,596	$ 38,251
Mar-14	349,683	$ 43,559
Apr-14	332,011	$ 41,054
May-14	366,539	$ 71,801
Jun-14	357,590	$ 72,532
Jul-14	374,118	$ 71,858
Aug-14	400,403	$ 77,632
Sep-14	378,295	$ 74,698
Oct-14	382,712	$ 76,015
Nov-14	367,385	$ 52,878
Dec-14	351,212	$ 46,182
Total	**4,304,223**	**$ 706,278**

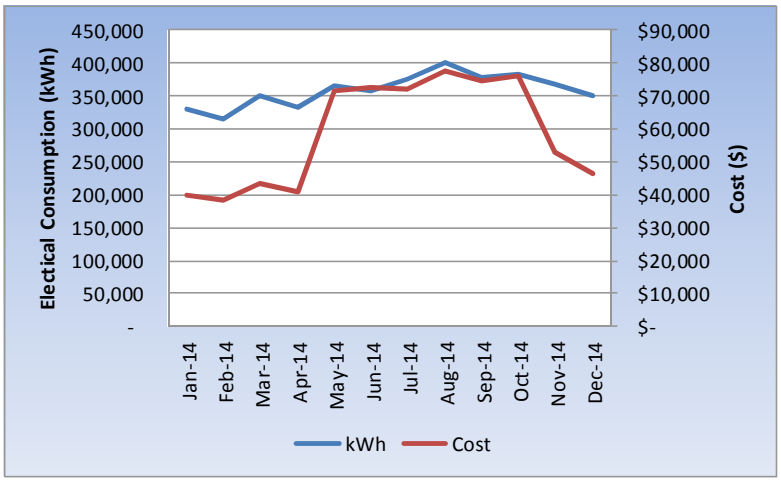


Figure 2-14 Annual Government Center Electrical Consumption and Costs

Natural gas is provided to the facility by SoCal Gas, through multiple meters. The annual natural gas consumption for calendar year 2014 was 52,469 therms at a cost of $39,745. Figure 2-15 shows a summary of the facility's natural gas consumption and costs for Calendar Year 2014.

Government Center Natural Gas Consumption and Costs

Month	Therms	Cost
Jan-14	6,879	$ 4,350
Feb-14	4,895	$ 4,089
Mar-14	6,318	$ 4,660
Apr-14	3,191	$ 2,777
May-14	3,203	$ 2,809
Jun-14	2,872	$ 2,533
Jul-14	3,038	$ 2,561
Aug-14	3,538	$ 2,815
Sep-14	3,379	$ 2,668
Oct-14	5,098	$ 3,554
Nov-14	5,203	$ 3,478
Dec-14	4,854	$ 3,454
Total	**52,469**	**$ 39,745**

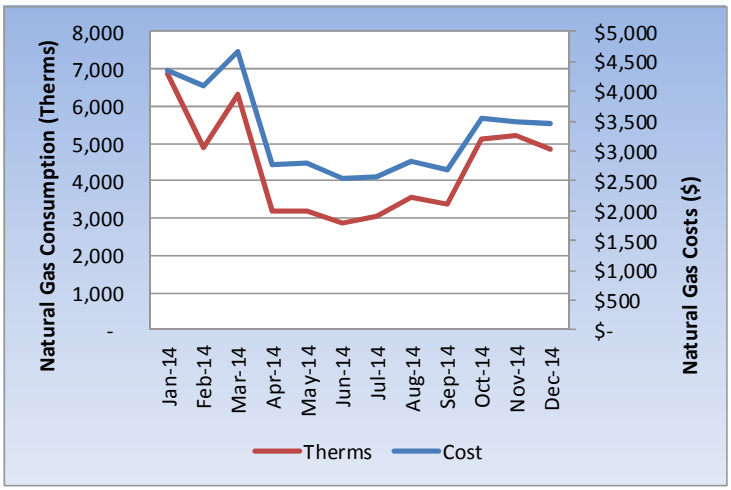


Figure 2-15 Annual Government Center Natural Gas Consumption and Costs

The utilities for each building will be allocated into use groups to analyze building efficiency and provide baselines for specific measures.

3.0 ENERGY ALLOCATION ANALYSIS

3.1 Overview of Building Energy Allocation

Building energy allocation analysis is the process of estimating individual system energy consumption as a fraction of a building's total annual energy consumption. The systems typically considered in the analysis include heating, ventilating, and air conditioning systems, lighting, plug loads, and any other energy consuming systems. For this analysis, we did not measure any systems, but instead developed energy allocation estimates based on information gathered during our audits and from experience at similar facilities.

As part of the IGA process, this effort is valuable. It provides the following benefits:

- Provides a deeper understanding of how a building uses energy.
- Estimates individual system energy usage, which is useful in calibrating the project's energy and economic analysis.
- Helps identify systems with excessive energy consumption and/or operational issues.

3.2 Electrical Annual End-Use Reconciliation

This section shows the electrical energy allocation for each of the eight buildings considered in this IGA. This allocation was developed from utility data analysis, information gathered during the site audits, and benchmark data from similar facilities that we have audited in the past. The allocations were performed through an iterative process, using sizing of major system equipment and estimated operating hours noted during the audit to begin the process. Using the electrical billing data for each site as a goal, the allocations were further refined to reach the results shown here. The allocations provide an insight into the efficiency of the building systems and provide the basis for the energy savings calculations for each measure. This section will focus on the electrical consumption for each building. The natural gas use for these buildings is for space and domestic water heating and a detailed allocation of these items would reveal very little.

The following sections demonstrate the electrical energy allocations for each of the eight buildings. The typical end use categories are lighting, fans, pumps, cooling and other loads. The allocation for "Misc. Equip." includes building plug load and computers. The kW values indicated for

end-use allocations are estimates based on equipment/system sizing observed during the audit and/or as built drawings. The total kW base load and total maximum kW load indicated for each facility is a summation of the estimated kW loads for each allocation, checked against utility billing data. For sites without a demand charge, no demand information was available to check the estimated maximum demand. These allocations provide a check for the baselines in the energy calculations for each ECM.

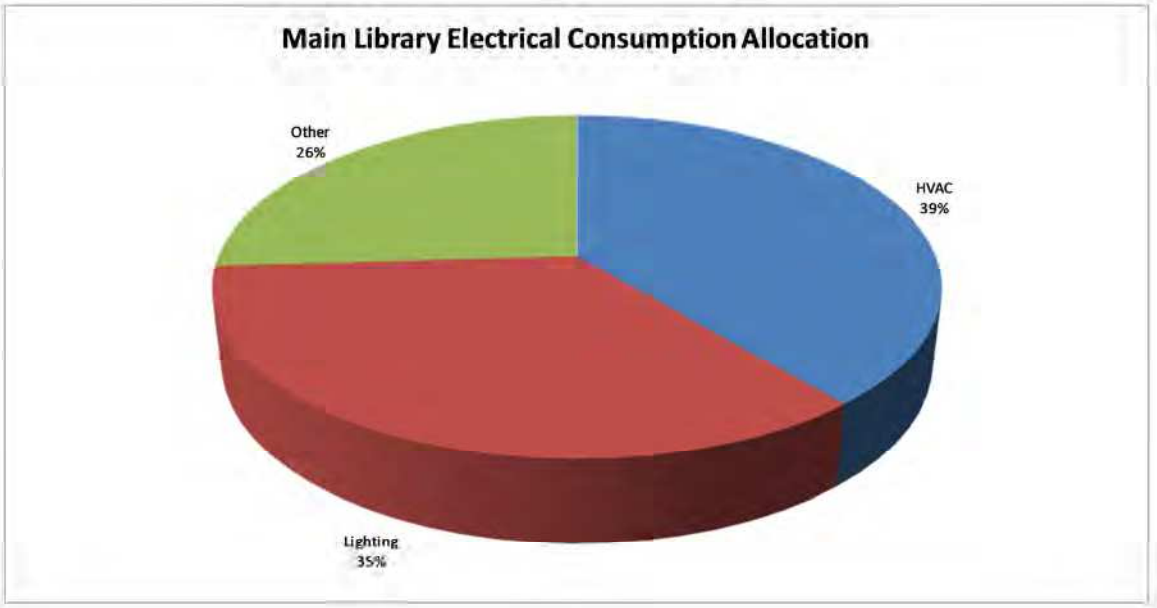
Main Library

Electric End Use Allocation

Building Name: LIB-San Luis Obispo
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 23,000

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	23,000	0.90	21	2400	49,680	2.2
	Fan Motors	23,000	1.00	23	2400	55,200	2.4
	Misc. Equip.	23,000	0.80	18	1800	33,120	1.4
	Electric Kitchen Equip.	23,000	0.00	0	3500	0	0.0
	DHW	0 / 23,000	0.00	0	8760	0	0.0
	Other	0 / 23,000	0.09	2	1800	3,600	0.2
Baseload Totals			Watts / Sq.Ft. Baseload	KW Base Load			
	Calculated From Utility Bills		2.79	64			

Weather Affected Loads	Resistance Heat	0 / 23,000	0.00	0	EFLH 0	0	0.0
	Cooling	23,000	0.00	0	EFLH 1000	0	0.00
Totals		Total Watts / Sq.Ft.	Maximum kW Load	Total kWh	kWh/SqFt		
	Calculated Totals		64	141,600	6.16		
	Utility Bill Total			142,289	6.19		100%

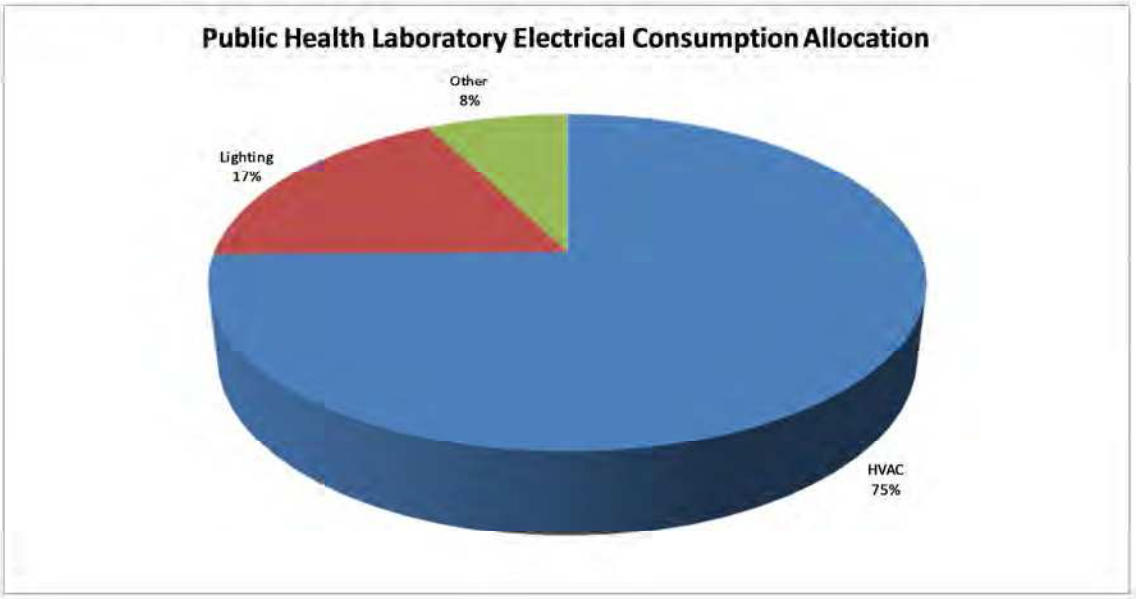


Public Health Laboratory

Electric End Use Allocation

Building Name: PTO66 - 2191 Johnson Ave HEALTH
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 11,806

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	11,806	0.90	11	3600	38,251	3.2
	Fan Motors	11,806		8	5000	37,500	3.2
	Misc. Equip.	11,806	0.35	4	4000	16,528	1.4
	Electric Kitchen Equip.	11,806	0.00	0	3500	0	0.0
	DHW	0 / 11,806		0	8760	0	0.0
	Other	0 / 11,806		0	4000	0	0.0
Baseload Totals			Watts / Sq.Ft. Baseload	KW Base Load			
	Calculated From Utility Bills		1.25	22			
Weather Affected Loads	Resistance Heat	0 / 11,806	0.00	0	EFLH 0	0	0.0
	Cooling	11,806	2.12	25	EFLH 5000	125,000	10.59
Totals		Total Watts / Sq.Ft.	Maximum kW Load	Total kWh	kWh/SqFt		
	Calculated Totals		47	217,280	18.40		
	Utility Bill Total			216,308	18.32		100%



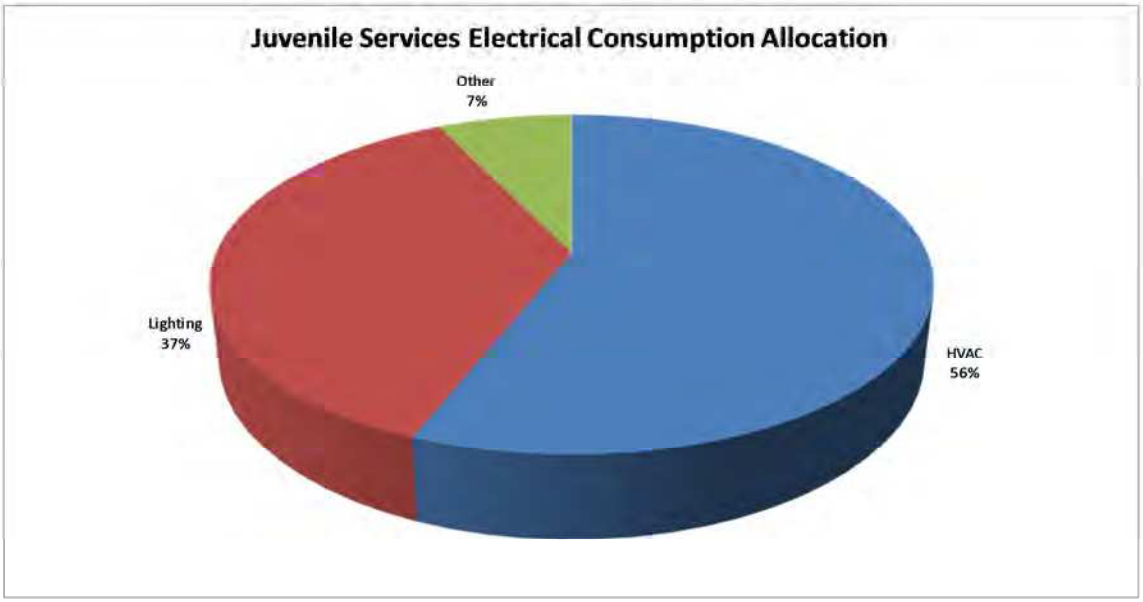
Juvenile Services

Electric End Use Allocation

Building Name: PIC35 - Juvenile Services
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 22,783

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	22,783	0.90	21	6000	123,028	5.4
	Fan Motors	22,783		15	7500	112,500	4.9
	Misc. Equip.	22,783		0	2000	0	0.0
	Electric Kitchen Equip.	22,783	0.00	0	3500	0	0.0
	DHW	0 22,783	0.00	0	8760	0	0.0
	Other	0 22,783		8	3000	24,000	1.1
Baseload Totals			Watts / Sq.Ft. Baseload	KW Base Load			
	Calculated From Utility Bills		0.90	44			

Weather Affected Loads	Resistance Heat	0 22,783	0.00	0	EFLH 0	0	0.0
	Cooling	22,783	1.10	25	EFLH 3000	75,000	3.29
Totals		Total Watts / Sq.Ft.	Maximum kW Load	Total kWh	kWh/SqFt		
	Calculated Totals		69	334,528	14.68		
	Utility Bill Total			334,463	14.68		100%



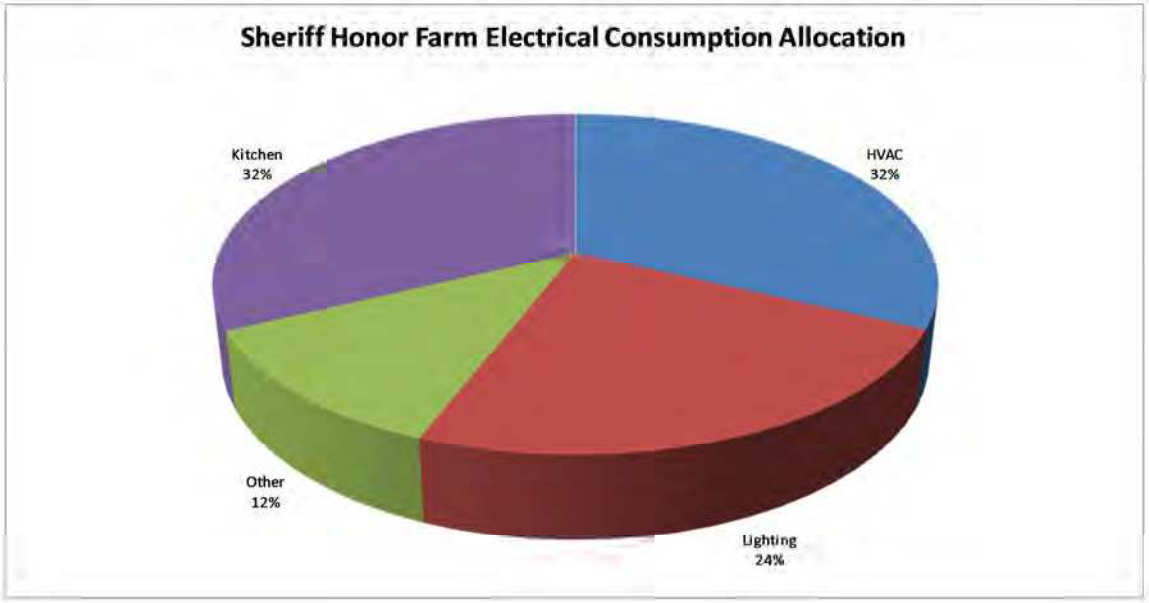
Sheriff - Honor Farm

Electric End Use Allocation

Building Name: PIC31 - Sheriff -Honor Farm
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 34,807

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	34,807	1.00	35	3200	111,382	3.2
	Fan Motors	34,807	0.80	28	4500	125,305	3.6
	Misc. Equip.	34,807	0.50	17	3200	55,691	1.6
	Electric Kitchen Equip.	34,807	0.00	50	3000	150,000	4.3
	DHW	0 34,807	0.00	0	8760	0	0.0
	Other	0 34,807			1800	0	0.0
Baseload Totals			Watts / Sq.Ft. Baseload	KW Base Load			
	Calculated From Utility Bills		2.30	130			

Weather Affected Loads	Resistance Heat	0 34,807	0.00	0	EFLH 0	0	0.0
	Cooling	8,400	1.43	12	EFLH 2000	24,000	2.86
Totals		Total Watts / Sq.Ft.	Maximum kW Load	Total kWh	kWh/SqFt		
	Calculated Totals		142	466,379	13.40		100%
	Utility Bill Total			468,098	13.45		

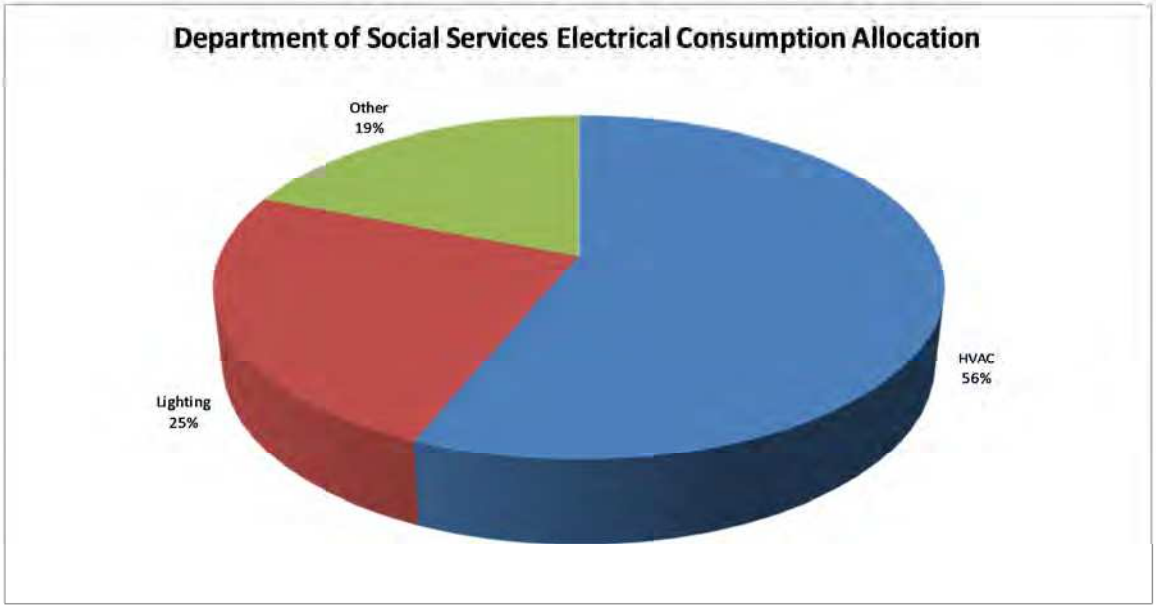


Department of Social Services

Electric End Use Allocation

Building Name: DSS PTR01 3433 Higuera St
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 57,498

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	57,498	0.90	52	3000	155,245	2.7
	Fan Motors	57,498		70	2600	182,000	3.2
	Misc. Equip.	57,498	1.00	57	2000	114,996	2.0
	HHW and CW Pumps	57,498		3	2400	6,000	0.1
	DHW	0 57,498	0.00	0	8760	0	0.0
	Other	0 57,498		0	1800	0	0.0
Baseload Totals	Calculated From Utility Bills		Watts / Sq.Ft. Baseload 1.90	KW Base Load 182			
Weather Affected Loads	Resistance Heat	0 57,498	0.00	0	EFLH 0	0	0.0
	Cooling	57,498	2.00	115	EFLH 1500	172,500	3.00
Totals		Total Watts / Sq.Ft.	Maximum kW Load	Total kWh	kWh/SqFt		
	Calculated Totals		297	630,741	10.97		
	Utility Bill Total			630,609	10.97		100%



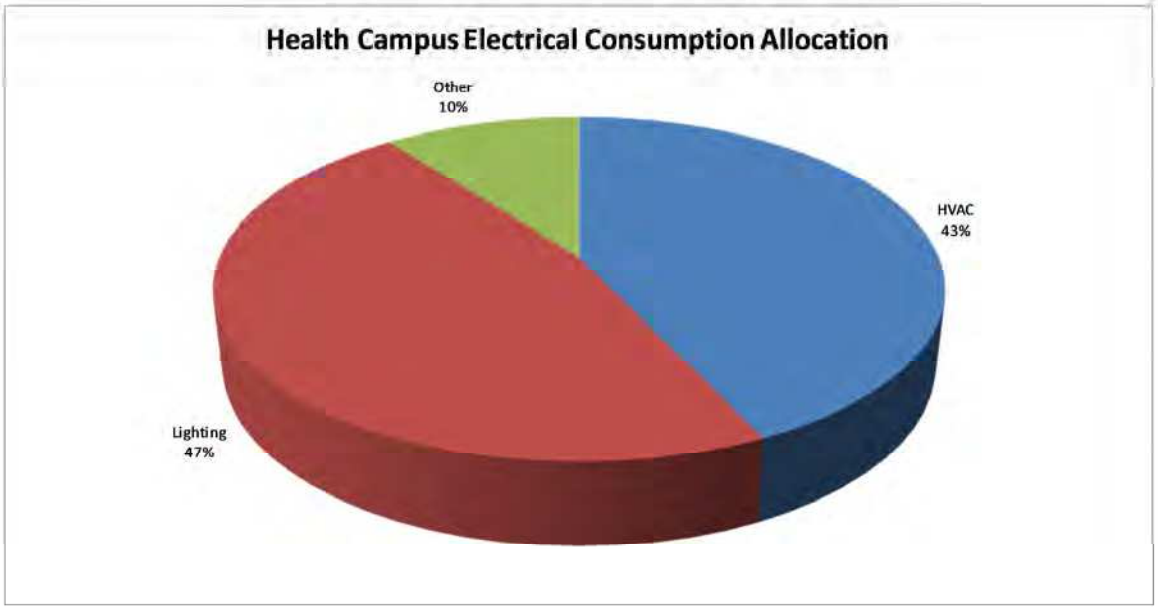
Health Campus

Electric End Use Allocation

Building Name: PTF66 - Health Campus - Johnson Ave
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 116,337

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	116,337	0.90	105	3600	376,932	3.2
	Fan Motors	116,337	0.40	47	3600	167,525	1.4
	Misc. Equip.	116,337	0.40	47	1800	83,763	0.7
	Electric Kitchen Equip.	116,337	0.00	0	3500	0	0.0
	DHW	0 / 116,337		0	8760	0	0.0
	Other	0 / 116,337		0	1800	0	0.0
Baseload Totals			Watts / Sq.Ft. Baseload	KW Base Load			
	Calculated From Utility Bills		1.70	198			

Weather Affected Loads	Resistance Heat	0 / 116,337	0.00	0	EFLH 0	0	0.0
	Cooling	116,337	1.29	150	EFLH 1200	180,000	1.55
Totals		Total Watts / Sq.Ft.	Maximum kW Load	Total kWh	kWh/SqFt		
	Calculated Totals		348	808,220	6.95		
	Utility Bill Total			806,367	6.93		100%



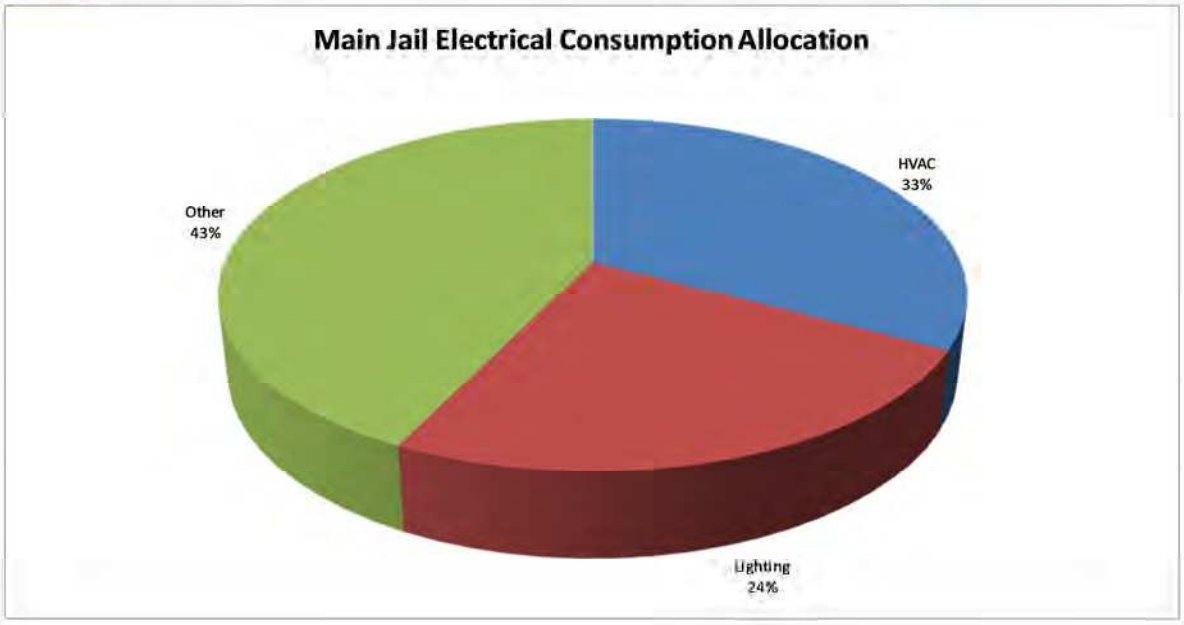
Main Jail & Female Jail

Electric End Use Allocation

Building Name: PIC20 - Main Jail & Female Jail
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 46,925

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	46,925	1.20	56	7000	394,170	8.4
	Fan Motors	46,925	0.80	35	6000	210,000	4.5
	Misc. Equip.	46,925	1.10	55	6000	330,000	7.0
	Electric Kitchen Equip.	46,925	0.00	0	3500	0	0.0
	DHW	0 46,925	0.00	0	8760	0	0.0
	Other	0 46,925	1.28	60	6000	360,000	7.7
Baseload Totals	**Calculated From Utility Bills**		**Watts / Sq.Ft. Baseload** 4.38	**KW Base Load** 206			

Weather Affected Loads	Resistance Heat	0 46,925	0.00	0	EFLH 0	0	0.0
	Cooling	46,925	2.13	100	EFLH 3200	320,000	6.82
Totals		**Total Watts / Sq.Ft.**	**Maximum kW Load**	**Total kWh**	**kWh/SqFt**		
	Calculated Totals		306	1,614,170	34.40		
	Utility Bill Total			1,613,254	34.38		100%



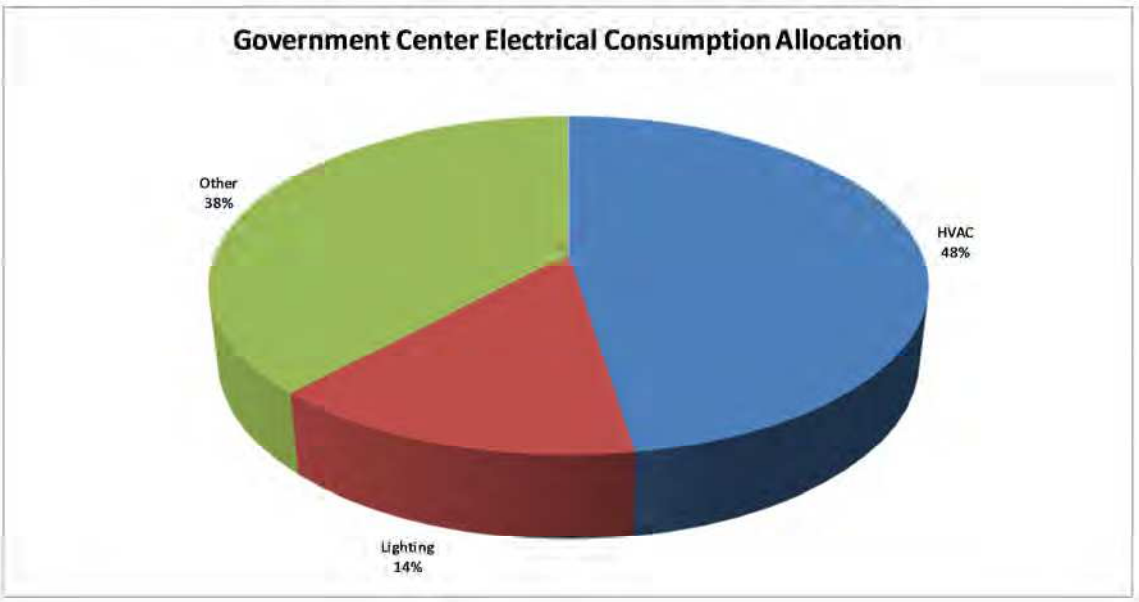
Government Center

Electric End Use Allocation

Building Name: PTB00 - Government Center
Year Billed: Jan/2014 - Dec/2014
Sq. Ft. Conditioned: 343,550

	Item	Associated Sq.Ft.	BenchMark Watts/SqFt	kW	Hours	Calculated kWh	Calculated kWh/Sq Ft
Baseload End-use	Lighting	343,550	0.90	309	2000	618,390	1.8
	Fan Motors	343,550	0.80	275	3500	961,940	2.8
	Misc. Equip.	343,550	0.80	275	3000	824,520	2.4
	Electric Kitchen Equip.	343,550	0.00	0	3500	0	0.0
	HHW and CHW Pumps	0 343,550		60	6000	360,000	1.0
	Other	0 343,550	0.45	155	3000	463,793	1.4
Baseload Totals			Watts / Sq.Ft. Baseload	KW Base Load			
	Calculated From Utility Bills		2.95	1,073			

Weather Affected Loads	Resistance Heat	0 343,550	0.00	0	EFLH 0	0	0.0
	Cooling	343,550		420	EFLH 2600	1,092,000	3.18
Totals		Total Watts / Sq.Ft.	Maximum kW Load	Total kWh	kWh/SqFt		
	Calculated Totals		1,493	4,320,643	12.58		
	Utility Bill Total			4,304,223	12.53		100%



4.0 ENERGY CONSERVATION MEASURES

The SST team has now identified key financially viable opportunities worthy of further evaluation that will allow the County to meet the goals identified for this program. The ECMs were selected and further developed through a combination of additional field visits, energy use analysis, constructability analysis, and progressive meetings with on-site staff. Where necessary, additional field audits of target systems were conducted, and the energy and economic analysis for each of these potential ECM opportunities was adjusted and refined.

The following section provides an overview of the recommended energy conservation measures identified in this IGA at the County sites analyzed.

ECM 1 Lighting Upgrades – Various Buildings

Existing Conditions

The most common fixture type found at San Luis Obispo County buildings are fluorescent fixtures with 32-watt T8 lamps and electronic ballasts. There are a handful of T12 fixtures and less than 10% of T8 fixtures will need ballast change at the time of re-lamp. In addition to the straight 32-watt lamps, there are u-bent 32-watt lamps.

Existing conditions for screw-in lamps vary and include incandescent, halogen and CFL technologies. Most of the lamps existing are high wattage. It is estimated that the average incandescent lamp will burn for 1,000-3,000 hours

Existing conditions for smaller plug-in lamps varied and included compact fluorescent lamps with a PL base or a BIAX base. PL lamps

have a remote ballast which makes these fixtures similar to the fluorescent T8 fixtures. With regard to performance, the compact fluorescent lamps emit light in all directions coming out of the CFL lamp – including up into the fixture, to the reflector and out of the fixture.

HID technologies found on the exterior of buildings include: metal halide, high pressure sodium, mercury vapor and halogen. Metal Halide fixtures typically best perform at up to 10,000 hours and can sometimes get 15,000 hours out of the system before replacement. High pressure sodium systems have a better life expectancy at 20,000 – 24,000 hours, however the yellow light emitted at 22 CRI makes everything look brown or dark without the ability to differentiate between colors. The picture below is an example from GE showing a CRI of 20 on the left and CRI 70 on right where you can see the green grass is not distinguished from surrounding colors.

Figure 4.1: HPS vs LED Exterior Lighting

New Government Center

The New Government Center is lit by various types of fluorescent light fixtures. A majority of the lighting throughout the New Government Center is 2-lamp or 3-lamp, 4-ft. 32w, T8 light fixtures. Open offices are lit by pendant mounted 2-lamp, 32w T8 fixtures while private offices are lit by 3-lamp T8 fixtures. Although a majority of the observed light fixtures are equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Corridors and lobby areas are lit by 13w and 26w 4-pin recessed compact fluorescents. The interior lighting systems are tied into the Delta Energy Management and Control System (EMCS) and are scheduled based on the building occupancy. Occupant overrides are installed in the spaces to allow for afterhours use. The private office and conference room lighting systems are also controlled with wall mounted and ceiling mounted occupancy sensors.

The parking garage or basement level of the new government center is lit by 115 Watt bi-level induction lighting fixtures.

Health Lab

The Health Lab is lit primarily using ceiling mounted 2-lamp, 4-ft, 32w, T8 Light fixtures. These spaces include the lab areas, exam rooms and the public health office areas. Each exam room is also equipped with a wall-mounted occupancy sensor. Corridors are lit using 13w, 4-pin recessed compact fluorescents. Other than the exam rooms, the lighting systems are manually controlled by the occupants with wall mounted switches. The exterior has wall mounted LED flood fixtures estimated at 70w per fixtures. These fixtures are controlled with by mechanical time clocks.

Health Center

The Health Center lighting consists primarily of recessed mounted 3-lamp, 4-ft, 32w, T8 Light fixtures.

Library

The majority of the light fixtures at San Luis Obispo County Library are found to be linear fluorescent. Approximately 432 fluorescent fixtures exist with linear or u-bent lamps. It has been found that the lamps in the 4' fluorescent fixtures are a mix of 32-watts and 25-watts; calculations have been adjusted to account for 50% of the lamps to be 32-watt T8 lamps and 50% to be 25-watt T8 lamps. The fixture lens is an 18-cell parabolic lens, which helps reduce horizontal glare - an essential for library lighting applications. Most spaces were found not to have occupancy controls with exception of the men and women's restrooms on the first floor. Most screw-in lamps at San Luis Obispo County Library were found to be compact fluorescent as well as incandescent screw-ins. Not only have some of these incandescent lamps been phased out, but they also consume a lot of energy when compared to newer technology.

Juvenile Hall

Juvenile Hall is lit by various types of fluorescent light fixtures. A majority of the lighting throughout the facility is 2-lamp or 3-lamp, 4-ft. 32w, T8 light fixtures. Although a majority of the observed light fixtures were equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Corridors and lobby areas are lit by 4-pin recessed compact fluorescents. Lighting control is local and manual. Occupancy sensors are not typically used, however, the administrative

offices were equipped with wall occupancy sensors. A portion of the exterior lighting is high pressure sodium fixtures.

Main Jail

The Main Jail is lit by various types of fluorescent light fixtures. A majority of the lighting throughout the facility is 2-lamp, 3-lamp, or 4-lamp 4-ft. 32w, T8 light fixtures. Some fixtures 2'x4' while others are 1'x4' with a mix of surface mount and recessed type fixtures. Although a majority of the observed light fixtures were equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Corridors and lobby areas are lit by 4-pin recessed compact fluorescents. Typically, lighting control is local and manual, and occupancy sensors are not used. During the audit, only one wall occupancy sensor was observed in an office in the administrative area. The exterior lighting has all been retrofitted to LED with the exception of the outdoor yards. The outdoor yards are equipped with 150 watt Metal Halide fixtures.

Sherriff's Honor Farm

The Sherriff's Honor Farm is lit by various types of fluorescent light fixtures. A vast majority of the lighting throughout the facility is 2-lamp or 3-lamp, 4-ft. 32w, T8 light fixtures. Although a majority of the observed light fixtures were equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Some interior and exterior corridors and entry areas are lit by 4-pin recessed compact fluorescents. Lighting control is local and manual. Occupancy sensors are not typically used.

Old Courthouse

The Old Courthouse is lit by various types of fluorescent light fixtures. A majority of the lighting throughout the Old Courthouse is 2-lamp or 4-lamp, 4-ft. 32w, T8 light fixtures. Although a majority of the observed light fixtures were equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Corridors and lobby areas are lit by 13w and 26w 4-pin recessed compact fluorescents. The interior lighting systems are tied into the Delta Energy Management and Control System (EMCS) and are scheduled based on the building occupancy. Overrides are installed in the spaces to allow for after hour usage. Beyond the Delta EMCS for lighting, all fixtures are manually and locally controlled. Occupancy sensors are not typically used.

Annex

The Annex is lit by various types of fluorescent light fixtures. A majority of the lighting throughout the Annex is 2-lamp or 4-lamp, 4-ft. 32w, T8 light fixtures. Although a majority of the observed light fixtures were equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Corridors and lobby areas are lit by 13w and 26w 4-pin recessed compact fluorescents. The interior lighting systems are tied into the Delta Energy Management and Control System (EMCS) and are scheduled based on the building occupancy. Overrides are installed in the spaces to allow for after hour usage. Beyond the Delta EMCS for lighting, all fixtures are manually and locally controlled. Occupancy sensors are not typically used.

Old Government Center

The Old Government Center is lit by various types of fluorescent light fixtures. A majority of the lighting throughout the Old Government Center is 2-lamp or 4-lamp, 4-ft. 32w, T8 light fixtures. Although a majority of the observed light fixtures were equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Corridors and lobby areas are lit by 13w and 26w 4-pin recessed compact fluorescents. The interior lighting systems are tied into the Delta Energy Management and Control System (EMCS) and are scheduled based on the building occupancy. Overrides are installed in the spaces to allow for after hour usage. Beyond the Delta EMCS for lighting, all fixtures are manually and locally controlled. Lighting in the Judges' Chambers is always on. Occupancy sensors are not typically used.

Department of Social Services

The Department of Social Services Building (DSS) is lit by various types of fluorescent light fixtures. A majority of the lighting throughout the DSS is 2-lamp or 4-lamp, 4-ft. 32w, T8 light fixtures. Although a majority of the observed light fixtures were equipped with 32w T8 lamps, the County has been replacing them with 25w T8 lamps upon failure. Corridors and lobby areas are lit by 13w and 26w 4-pin recessed compact fluorescents. There is task lighting built into the office cubicles consisting of T8 lamps. The interior lighting systems are not tied into the Delta Energy Management and Control System (EMCS), so all fixtures are manually and locally controlled. Occupancy sensors are not typically used. Exterior lighting consists of pole mounted LED lights. Exterior lighting is controlled by mechanical time clocks located in the main electrical room.

ECM Description

California Title 24 guidelines have become more stringent since their update on July 1, 2014. Changes to the energy standards include requirements for more lighting controls where a fixture is retrofit or replaced. A fixture retrofit or alteration is considered when a lighting luminaire is disconnected from a circuit where wiring, re-wiring, or replacing of fixture occurs. Consider the example given below:

- Space type: Shared office with available daylight
- Existing: Number of fixtures existing: 6 fluorescent troffers with 2-F32T8 lamps
- Total office energy consumption: 360 watts (at 60 watts per fixture)

Proposed Scenario #1

Re-lamp for: 6 fluorescent troffers using new 12w T8 LED lamps

Total office energy consumption: 168 watts (at 28 watts per fixture)

Proposed Scenario #2

If a new retrofit kit were to be installed, which would require removal of ballast and wiring of LED driver, then the required lighting controls are as follows:

- Daylight sensor
- Dimming driver
- Ceiling or wall mounted occupancy sensor

In addition wiring will need to be adjusted so that only fixtures closest to the available daylight will dim.

ROI comparison

Scenario #1: Espen RetroFlex HE LED Tubes Re-lamp	
Total Re-lamp Cost	$507.57
Annual Energy Savings	576 kWh
Annual Bill Savings	$97.92
Estimated Incentive	N/A
Payback in Years	5.2

Scenario #2: LED Retrofit Kit Including dimming driver, daylight sensor and occupancy sensor	
Total Retrofit Cost	$2,178.45
Annual Energy Savings	652 kWh
Annual Bill Savings	$110.77
Estimated Incentive	$80.96
Payback in Years	18.9

As a result, retrofitting the existing T8 fixtures with linear tube LEDs, such as the Espen Retroflex HE LED T8 tube, designed to use the existing electronic ballast provides a low cost, energy efficient upgrade applicable throughout a majority of the County buildings. Therefore, a scope of work comparable to Scenario #1 was chosen for this ECM.

PG&E will install lighting upgrades that maximize energy savings and enhance lighting quality while minimizing the payback period. The County will greatly benefit by these lighting upgrades by reducing energy consumption, improving light quality, enhancing working conditions, and reducing operation and maintenance costs. Based on these goals, we propose the following lighting retrofit solutions for the facilities evaluated:

LED T8 Tube Re-lamp

The primary focus of this solution is to reduce the County's life cycle costs associated with the lighting systems including utility consumption and operation and maintenance costs. Additional benefits include improvement in the existing lighting operating systems and lighting quality.

The new Espen Retroflex LED Tube has a CRI of 83, which means the colors throughout the building will be more vibrant and at only 12-watts, all fixtures will be saving over 50% of energy by replacing the existing fluorescent T8's with this lamp. In addition to being a simple install, the re-lamp of existing fixtures (only) does not trigger T24 requirements and makes for a cost effective energy conservation measure. Additional benefits from this product include long life—rated at 50,000 hours and a 5-year warranty.

U-Bent LED T8 Tube Re-lamp

The Green Creative T8 16w U-bent DIR lamp will replace existing 32w fluorescent u-bent lamps, allowing for 50% energy savings. This energy conservation measure will achieve energy savings, light quality improvement and long life expectancy. An added benefit will be project cost savings accomplished due to no re-wiring required, as this lamp will work with existing instant start ballasts.

LED Screw-in Lamps: A19, PAR20, PAR38

While this energy conservation measure focuses on reducing energy, the added benefit from the re-lamp with LED screw-ins is the lifespan of the LED's. The proposed LED screw-ins are rated for over 25,000 hours, which means they will not need changing for over 8-10 years. By replacing existing CFL and halogen lamps with new LED lamps we will be saving 50% of energy and provide an instant-on light versus having to wait 10-15 minutes for other lamp technologies to warm up to full light output.

PL LED Re-lamp

The Titanium CRI series PL lamp from Green Creative plugs into an existing PL socket, which makes for an easy re-lamp. Because LED lamps are more directional than other technologies, most of the light escapes out of the downlight can instead of relying on the reflector to bounce light out. Outstanding savings are possible due to the efficiency, long expectancy life and directionality of the LED's.

BIAX LED Tube Re-lamp

Like the T8 LED tubes and PL lamps, the BIAX lamps will be using existing ballasts. BIAX fluorescent systems have been a tough item to find retrofits for because of their unique size – typically an F17 lamp is too long and does not provide enough light. The 20w LED BIAX lamp from RemPhos will provide about 100 lumens per watt, which will be similar to what exists. This energy conservation measure will achieve energy savings, light quality improvement and long life expectancy. An added benefit will be project cost savings accomplished due to no re-wiring required, as this lamp will work with existing ballasts.

21-watt LED Retrofit Kit

Existing indirect lighting fixtures with mercury vapor lamps will be replaced with 21-watt LED retrofit kits. Existing fixtures are in good condition and therefore a great candidate for a retrofit kit instead of replacing each fixture. At time of ordering materials one fixture would be taken down for sample and be sent to the Noribachi manufacturing warehouse. Noribachi will test for heat dissipation and performance, as well as build the remaining kits for installation in the field. This custom-built retrofit kit will use only 22 watts, instead of the 205 that the mercury vapor system is using. Additional benefits include improved CRI and long life expectancy.

LED Lowbay Fixture

Existing HID fixtures with metal halide (MH) lamps used in a high bay scenario will be replaced with the Noribachi Lowbay.4 fixture. The fixture uses 126 watts vs. the 250 watts for the MH fixture.

Additional benefits include improvement in the existing lighting operating systems and lighting quality. The Noribachi Lowbay.4 fixture will save 50% in energy, have better lumen maintenance and last over 100,000 hours.

LED Flood Lights

New LED floodlight fixtures will replace existing halogen and high pressure sodium floodlights, not only improving the light quality but also life expectancy of the technology. These LED fixtures, with a rated lamp life of 100,000 hours, will reduce service for the exterior lighting (when also changing the wall packs).

LED Wall Packs

This solution will not only allow for energy savings, but the new LED wall pack fixtures will replace high pressure sodium wall packs, improving the light quality and life expectancy of the exterior lighting. This fixture, rated at 100,000 hours, will reduce service for exterior lighting (when also changing floodlights).

LED Canopy

The Canopy fixture from Noribachi comes with a high impact polycarbonate lens, which is great for applications where fixtures might be exposed to vandalism or abuse. This energy conservation measure focuses on improving the light quality, light levels and achieving energy savings. Rated at 100,000 life hours, this LED fixture will eliminate costly maintenance for over 10 years.

LED Shoebox

Another great LED application is for the exterior parking lots. The Shoebox from Noribachi will improve light levels, light quality and last for over 10 years. Because the performance of this fixture is so great, we are able to reduce energy consumption by 70% while still accounting for better CRI and lumen maintenance.

Occupancy Sensors

Occupancy sensors are not included in the recommend scope of work for a number of reasons:

1. In general, during the lighting audit it was observed that building occupants were very diligent in keeping lights turned off in various areas when the space was not in use, thus reducing potential occupancy sensor savings.
2. In downtown buildings that have existing Delta EMCS lighting control, lights are already automatically turned off at the end of the day (approximately 6:00PM) and automatically turned on in the morning (approximately 8:00AM). This eliminates almost all

of the savings opportunity for occupancy sensors in these buildings.

3. In the secured facilities, occupancy sensors were not recommended due to safety concerns for light levels.
4. In the health center and health campus buildings, it was observed that occupancy sensors exist in most applicable areas.

Scope of Work

The analysis was created by performing room by room audits to capture the lighting system design and operational data. This included fixture types, watts used and run hours (through site interviews and/or data loggers). The existing information was input into Microsoft Excel based workbooks to determine the energy baseline and evaluate the current conditions. Once the retrofit was selected by reviewing the existing systems and conditions, the new power (based on manufacturer data) was input into the workbooks to determine the new kilowatt (kW) and kilowatt-hour (kWh) usage. The resulting kW and kWh savings were then determined and converted to dollars saved by applying the appropriate electric rates.

Appendix A contains a summary of the type of fixtures, estimated quantities, estimated savings (watts per fixture), estimated average life and a detailed room by room audit for each building evaluated, which includes exiting fixture counts and proposed retrofit fixture quantities per room and per building. Pre- and post-retrofit energy use and savings calculations are also included. Existing lighting operating hours were determined through on-site interviews with personnel, observations during the audit, and examination of the programmed lighting hours in the Delta EMCS. Solutions listed in Appendix A are detailed in the ECM Description section above.

Appendix B contains manufacturers cut sheets for all the solutions identified in Appendix A.

ECM Benefits

The expected benefits of this ECM include:

- Significant electrical energy and demand savings.
- Reduced lighting system O&M costs.
- Improved lighting system performance.
- Reduction of the County of San Luis Obispo's carbon footprint by reducing greenhouse gas emissions.

ECM 2 Variable Flow CHW - Government Center Complex and Library

Existing Conditions

New Government Center

Figure 4-2: The existing three-way CHW valves on the AHUs limit the energy savings potential of the existing CHW pump VFDs.

Chilled Water (CHW) at the New Government Center is produced at the Government Center Complex Central Plant. The CHW is pumped to the facility by two (2) 25-hp chilled water pumps located in the parking garage level mechanical room. Only one of the pumps is required to provide adequate flow to the three (3) air handling units (AHUs), the other pump provides redundancy in the event of a pump failure. These pumps are both equipped with variable frequency drives (VFDs) and are tied into the Delta Energy Management and Control System (EMCS). Although equipped with VFDs, the pumps are not capable of operating with full range of modulation, because of the current valve configuration. Instead, operating modes are assigned in the EMCS based on specific plant conditions to provide stages. The operating modes then dictate the CHW pump VFD output or frequency. This control method was employed because optimal variable flow programming based on differential pressure is not possible as the three (3) CHW control valves on the AHU cooling coils are all three-way. Because the CHW bypasses exist on the airside equipment, a constant flow rate will be maintained throughout the system regardless of the actual cooling demand. In order to achieve some benefit out of the installed CHW pump VFDs, the operating modes are assigned to provide staged operation.

Old Government Center & Annex

Chilled Water (CHW) used at the Old Government Center and Annex is produced at the Government Center Complex Central Plant, located in the Old Courthouse building. The CHW is pumped to the Old Government Center by one 15-hp chilled water pump located in the

Government Center Complex Central Plant. The single pump configuration provides no redundancy. The pump provides adequate flow to the nine (9) fan coil units (FCUs) and four (4) air handling units (AHUs) that serve the Old Government Center. This pump is equipped with a variable frequency drive (VFD) that is tied into the Delta Energy Management and Control System (EMCS). Although equipped with a VFD, the pump is not capable of operating with full range of modulation. Instead, operating modes are assigned in the EMCS based on specific plant conditions to provide stages. The operating modes then dictate the CHW pump VFD output or frequency. This control method was employed as optimal variable flow programming based on differential pressure is not possible as the thirteen (13) CHW control valves on the AHU and FCU cooling coils are all three-way. Because the bypasses exist on the airside equipment, a constant flow rate will be maintained throughout the system regardless of the actual cooling demand. In order to achieve some benefit out of the installed CHW pump VFDs, the operating modes are assigned to provide staged operation.

The Annex has six (6) small ½ -HP in-line booster pumps located in the main electrical room, two for each floor. These booster pumps serve the twenty-three (23) fan coils in the Annex and provide adequate flow. These booster pumps do not have VFDs, but their start/stop operation is scheduled by the EMCS system along with the fan coil units that they serve. The chilled water booster pumps operate whenever fan coil operation is enabled, regardless of outside air temperature or cooling load.

Old Courthouse

Chilled Water (CHW) at the Old Courthouse is produced at the Government Center Complex Central Plant, located in the Old Courthouse building. The CHW is pumped to the Old Courthouse by one 5-hp chilled water pump located in the Government Center Complex Central Plant. The single pump configuration provides no redundancy. The pump provides adequate flow to the eighty (80) fan coil units (FCUs) and one air handling unit (AHU) that serve the Old Courthouse. This pump is equipped with a variable frequency drive (VFD) that is tied into the Delta Energy Management and Control System (EMCS). Although equipped with a VFD, the pump is not capable of operating with full range of modulation. Instead, operating modes are assigned in the EMCS based on specific plant conditions to provide stages. The operating modes then dictate the CHW pump VFD output or frequency. This control method was employed as optimal variable flow programming based on differential pressure is not possible as the eighty-one (81) CHW control valves on the AHU and FCU cooling

coils are all three-way. Because the bypasses exist on the airside equipment, a constant flow rate will be maintained throughout the system regardless of the actual cooling demand. In order to achieve some benefit out of the installed CHW pump VFDs, the operating modes are assigned to provide staged operation.

ECM Description

This measure replaces the three-way valves with two-way valves at the New Government Center, Old Government Center/Annex, Old Courthouse and Library cooling systems and also replaces the six small booster pumps in the Annex with one new larger variable speed pump. The replacement of the three-way valves with two-way valves and the new Annex variable speed pump will give the system the ability to properly account for variations in cooling load. The County will benefit by converting the CHW distribution system to true variable flow. Converting the system will reduce pumping energy during part load conditions.

The pump flow will be controlled off of differential pressure rather than staged operating modes. A differential pressure set point will be assigned in the existing EMCS and will be maintained by the CHW VFDs. During partial load conditions, the new valves will modulate the volume of water delivered to each coil and eliminate the need for a bypass. As space conditions are satisfied, the two-way control valves will begin to close, thus increasing pressure in the chilled water lines. The VFDs will then reduce the flow of the pumps to maintain the differential pressure set point. The reduction in flow will result in a decrease in pumping energy. When the zones call for cooling, the valves will open, the pressure in the chilled water lines will drop, and the VFDs will increase speed to meet the assigned set point.

Additional redundant distribution pumps were considered for buildings that have only one secondary pump for CHW service, but were not included as they do not provide energy savings. If the County would like to add redundant pumps to the scope of work, they can be priced and included.

The energy use and savings for this measure were determined as part of the central plant upgrades for the Government Center Complex, with a separate ECM run for the CHW variable pumping. Refer to the Appendix C summary table for the results.

Scope of Work

The conversion will include:

- Replacement of the existing three-way CHW control valves with two-way control valves
    - New Government Center - install (3) CHW 2-way valves for (3) AHUs
    - Old Courthouse – install (1) CHW 2-way valve for (1) AHU, and (80) CHW 2-way valves for (80) FCUs
    - Old Government Center – install (4) CHW 2-way valves for (4) AHUs, and (7) CHW 2-way valves for (7) FCUs
    - Annex – install (24) CHW 2-way valves for (24) FCUs
    - Library – install (30) CHW 2-way valves for (30) FCUs
    - Existing differential pressure sensors in New Government Center and Old Government Center and Old Courthouse will remain
    - Existing CHW distribution piping, AHUs and fan coils are in adequate condition and will remain
- The reprogramming of the pumping sequence in the Delta EMCS.
- Replacement of the Annex with a new variable flow pump (estimated at 250 gpm, 120 feet of head), with piping stubs for a redundant pump and new shutoff valves in the pump closet.

ECM Benefits

- Reduce Electrical Consumption
- Minimize Electrical Utility Costs

ECM 3 Variable Flow HHW - Government Center Complex and Library

Existing Conditions

New Government Center

Figure 4-3: The existing three-way hot water valves on the AHUs limit the energy savings potential of the existing HHW pump VFDs.

Heating Hot Water (HHW) at the New Government Center is produced at the Government Center Complex Central Plant. The hot water is pumped to the facility by two (2) 15-hp hot water pumps located in the parking garage level mechanical room. Only one of the pumps is required to provide hot water flow throughout the building. The other pump provides redundancy in the event of pump failure. The hot water is pumped to the three (3) air-handling units (AHUs), to variable air volume boxes with hot water reheat on the first floor, and hot water Fan Coil Units (FCUs) located on the perimeter of each floor.

These HHW pumps are both equipped with variable frequency drives (VFDs) and are integrated into the Delta Energy Management and Control System (EMCS). Although equipped with VFDs, the pumps are not capable of operating with full range of modulation. Instead, operating modes are assigned in the EMCS based on specific plant conditions to provide stages. The operating modes then dictate the hot water pump VFD output or frequency. This control method was employed as optimal variable flow programming based on differential pressure is not possible as the three (3) HHW control valves on the AHU heating coils are all three-way. Based on a review of the mechanical drawings, the control valves on the FCUs and VAV box reheats are all two-way. Because the bypasses exist on the main airside equipment, a constant flow rate will be maintained throughout the system regardless of the actual heating demand. In order to achieve added benefit out of the installed hot water pump VFDs, the operating modes are assigned to provide staged operation.

Old Government Center & Annex

Heating Hot Water (HHW) used at the Old Government Center and Annex is produced at the Government Center Complex Central Plant, located in the Old Courthouse building. The HHW is pumped to the Old Government Center by one 15-hp heating hot water pump located in the Government Center Complex Central Plant. The single pump configuration provides no redundancy. The pump provides adequate flow to the nine (9) fan coil units (FCUs) and four (4) air handling units (AHUs) that serve the Old Government Center. This pump is equipped with a variable frequency drive (VFD) that is tied into the Delta Energy Management and Control System (EMCS). Although equipped with a VFD, the pump is not capable of operating with full range of modulation. Instead, operating modes are assigned in the EMCS based on specific plant conditions to provide stages. The operating modes then dictate the HHW pump VFD output or frequency. This control method was employed as optimal variable flow programming based on differential pressure is not possible as the thirteen (13) HHW control valves on the AHU and FCU heating coils are all three-way. Because the bypasses exist on the airside equipment, a constant flow rate will be maintained throughout the system regardless of the actual heating demand. In order to achieve some benefit out of the installed HHW pump VFDs, the operating modes are assigned to provide staged operation.

The Annex has six (6) small ½ -HP in-line booster pumps located in the main electrical room, two for each floor. These booster pumps serve the twenty-three (23) fan coils in the Annex. These booster pumps do not have VFDs, but their start/stop operation is scheduled by the EMCS system along with the fan coil units that they serve. The heating hot water booster pumps operate whenever fan coil operation is enabled, regardless of outside air temperature or heating load.

Old Courthouse

Heating Hot Water (HHW) at the Old Courthouse is produced at the Government Center Complex Central Plant, located in the Old Courthouse building. The HHW is pumped to the Old Courthouse by one 3-hp heating hot water pump located in the Government Center Complex Central Plant. The single pump configuration provides no redundancy. The pump provides adequate flow to the eighty (80) fan coil units (FCUs) and one air handling unit (AHU) that serve the Old Courthouse. This pump is equipped with a variable frequency drive (VFD) that is tied into the Delta Energy Management and Control System (EMCS). Although equipped with a VFD, the pump is not capable of operating with full range of modulation. Instead, operating modes are assigned in the EMCS based on specific plant conditions to

provide stages. The operating modes then dictate the HHW pump VFD output or frequency. This control method was employed as optimal variable flow programming based on differential pressure is not possible as the eighty-one (81) HHW control valves on the AHU and FCU heating coils are all three-way. Because the bypasses exist on the airside equipment, a constant flow rate will be maintained throughout the system regardless of the actual heating demand. In order to achieve some benefit out of the installed HHW pump VFDs, the operating modes are assigned to provide staged operation.

ECM Description

This measure replaces the three-way valves with two-way valves at the New Government Center, Old Government Center, Old Courthouse and Library heating systems and also replaces the six small booster pumps in the Annex with a new larger variable speed pump. The replacement of the three-way valves with two-way valves the new Annex variable speed pump will give the system the ability to properly account for variations in heating load. The County will benefit by converting the HHW distribution system to true variable flow. Converting the system will reduce pumping energy during part load conditions.

The pump flow will be controlled off of differential pressure rather than staged operating modes. A differential pressure set point will be assigned in the existing EMCS and will be maintained by the HHW VFDs. During partial load conditions, the new valves will modulate the volume of water delivered to each coil and eliminate the need for a bypass. As space conditions are satisfied, the two-way control valves will begin to close, thus increasing pressure in the hot water lines. The VFDs will then reduce the flow of the pumps to maintain the differential pressure set point. The reduction in flow will result in a decrease in pumping energy. When the zones call for heating, the valves will open, the pressure in the hot water lines will drop, and the VFDs will increase speed to meet the assigned set point.

The energy use and savings for this measure were determined as part of the central plant upgrades for the Government Center Complex, with a separate ECM run for the HHW variable pumping. Refer to the Appendix C summary table for the results.

Scope of Work

The conversion will include:

- Replacement of the existing three-way HHW control valves with two-way control valves

- New Government Center - install (3) HHW 2-way valves for (3) AHUs, and (3) HHW 2-way valves for (3) reheat coils
- Old Courthouse – install (1) HHW 2-way valve for (1) AHU, and (80) HHW 2-way valves for (80) FCUs
- Old Government Center – install (4) HHW 2-way valves for (4) AHUs, and (7) HHW 2-way valves for (7) FCUs
- Annex – install (24) HHW 2-way valves for (24) FCUs
- Library – install (30) HHW 2-way valves for (30) FCUs
- All existing 2-way coil control valves will remain, and are located on reheat coils in the New Government Center, Old Courthouse, and Old Government Center
- Existing differential pressure sensors in New Government Center and Old Government Center and Old Courthouse will remain
- Existing HHW distribution piping, AHUs and fan coils are in adequate condition and will remain

- The reprogramming of the pumping sequence in the Delta EMCS.
- Replacement of the Annex with a new variable flow pump estimated at 160 gpm, 120 feet of head), with piping stubs for a redundant pump and new shutoff valves in the pump closet.

ECM Benefits

- Reduce pumping energy and electrical consumption
- Reduce associated natural gas heating costs

ECM 6 Chiller Replacement - Government Center Complex

Existing Conditions

Cooling for the Government Center Complex is currently provided by two Trane water cooled screw chillers, rated at 250 tons and 150 tons each. There is also a gas-fired absorption chiller that is currently non-operational. The chilled water is distributed to the New Government Center, Library, Old Government Center, Annex, and Old Courthouse via a partially variable flow primary/secondary loop. The two primary 15-HP CHW pumps are controlled by variable frequency drives based on the number and size of chiller(s) in operation. The speed of the various secondary CHW pumps is controlled either by variable frequency drives based on chilled water coil valve position or by constant speed depending on the building. The existing cooling towers were evaluated and look to be in good operating condition, and therefore do not need to be replaced at this time. Control and monitoring of the system is provided by the Delta EMCS, as detailed above in ECMs 2 and 3.

Cooling for the buildings is provided in 4 stages based on total building load:

1. Cooling tower water is run through a plate and frame heat exchanger to provide “free” cooling to the chilled water loop. The economizer mode using the cooling tower and heat exchanger is enabled when there is a call for cooling (i.e., chilled water pumps are on) and the outside wet bulb temperature is less than 5 degrees below the chilled water return temperature (56F).
2. After the delta T rises above the threshold, the smaller chiller is enabled and operates to provide cooling for the buildings. The threshold for enabling a chiller is when either the return chilled water temperature is greater than 2-5 degrees above the desired return temperature (56F) for a set period of time (such as 15 minutes) or the chilled water supply temperature is above its set-point (42F) by 2-5 degrees for a set period of time.
3. After the delta T rises above the threshold (above), the larger chiller is enabled and provides cooling for the buildings, and the smaller chiller is disabled.
4. If the delta T continues to rise above the threshold, then both chillers are enabled and provide cooling for the buildings.

ECM Description

New water cooled chillers capable of utilizing the existing cooling tower are available which operate at much higher efficiencies than the current

chillers. A variable speed, magnetic bearing chiller would provide excellent part load efficiency and decreased maintenance requirements. The scope would include:

- Remove existing two screw chillers and 160 ton Thermax absorber
- Install two (2) Daikin/Turbocor 250 Ton (nominal, or equal) magnetic bearing, R134A, centrifugal chillers
- Connect required piping to building and condenser water loops
- Replace the two existing primary pumps with two new pumps
- Upgrade the ASHRAE 15 compliant refrigerant monitoring system
- Integrate Controls to the EMCS
- All secondary pumps to remain, with the exception of the booster pumps for the Annex

Cooling and Heating Load Calculations

Energy savings for the County of San Luis Obispo downtown Government Buildings and Heath Center were determined by the PG&E SST team using the Carrier Hourly Analysis Program (HAP) to generate energy simulation models. The models were created using HAP version 4.9. The program is two powerful tools in one package, as it provides versatile features for designing HVAC systems and performing energy analysis. By combining the design and energy features in one package significant time savings are achieved, as the load conditions can be verified along with the energy use. In addition, as an industry accepted building energy simulation software, it can be used to qualify building for LEED certification and to validate energy savings as one of the International Performance Measurement & Verification Protocol (IPMVP) measurement and verification (M&V) options.

By using HAP, the PG&E SST team is able to verify the load conditions, calculate energy savings and quickly analyze alternative energy conservation measures (ECMs). In addition, the energy simulation software provides detailed output reports to validate that the model is “operating per the design intent”. HAP is in continuous development and is maintained by Carrier and the resulting savings analysis tools, approved by the industry through years of use, are impartial to the user. The result is an energy savings estimate that the County of San Luis Obispo can rely on due to the use of an industry accepted, non-proprietary analysis.

The modeling process occurs in three (3) steps which will be described in the following sections. The steps include:

- Developing a Calibrated Model
- Establishing ECM or parametric runs
- Validating HAP Outputs and Results

Model Development and Calibration Process

The first step in the energy savings analysis approach is to develop a model for each building that is to be evaluated. For the County of San Luis Obispo, the Health Center and downtown Governmental Center Complex (with the Library, Old Government Center, New Government Center, Old Courthouse and Annex) were selected based on the central chiller and heating plant ECMs identified and the need to also validate the cooling and heating loads. As part of the process, the PG&E SST team performed detailed site walks for each of the facilities in which extensive data was collected. This data, along with design drawings made available by the County, were used as the basis of the model development. Data used as inputs to the HAP models include:

- Building floor plans, architectural, electrical, mechanical, plumbing and structural drawings to define building geometry and HVAC thermal zone definition.
- Observed equipment nameplate data and equipment type to define HVAC system details
- Mechanical schedules to further define HVAC specifications
- HVAC schedules and HVAC temperature set points to define operating parameters
- Occupancy schedules to reflect proper building loading attributed to the occupants
- Lighting wattage and observed lighting schedules to reflect both energy consumption and associated building loads

After the above described data is input into the model, the remaining unknown variables are then adjusted so that the simulated annual energy usage matches the energy usage for the baseline period within a specified tolerance.

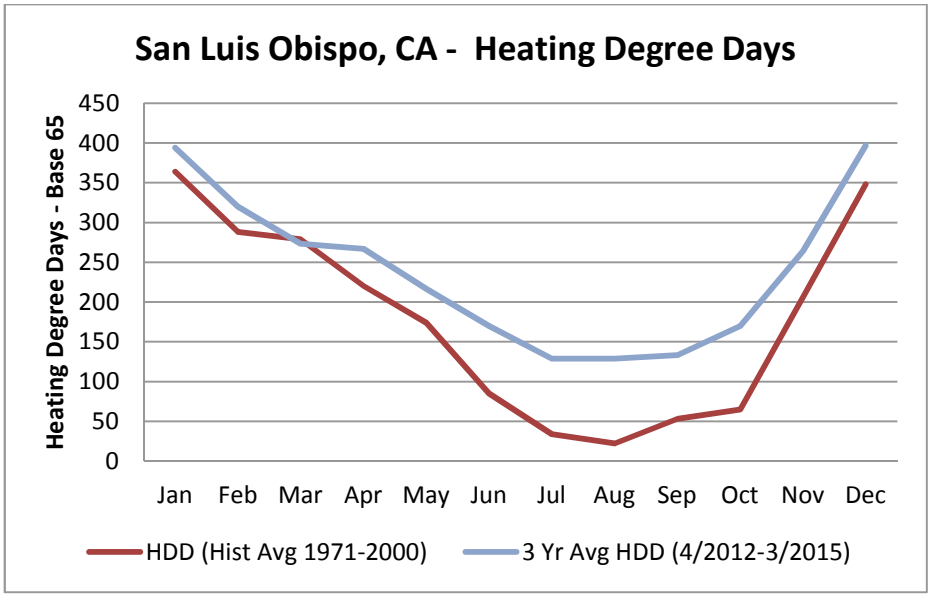
HAP simulates building energy usage on an hourly basis for the entire year. The hourly simulation takes into account the user inputs and the weather data local to the model. The hourly energy usage is then added together to create both monthly and annual building energy consumption. The outputs of the simulation include electrical

consumption (kWh), electrical demand (kW) and natural gas consumption (therms) for each scenario. These values must match the baseline (utility) consumption and demand to within a specified tolerance for a model to be considered calibrated. The PG&E SST team has calibrated the HAP models on a +/- 5% tolerance goal for the annual consumption (electricity and gas) with the monthly trends resembling the profiles for consumption and demand (kW) and generally within +/- 15%.

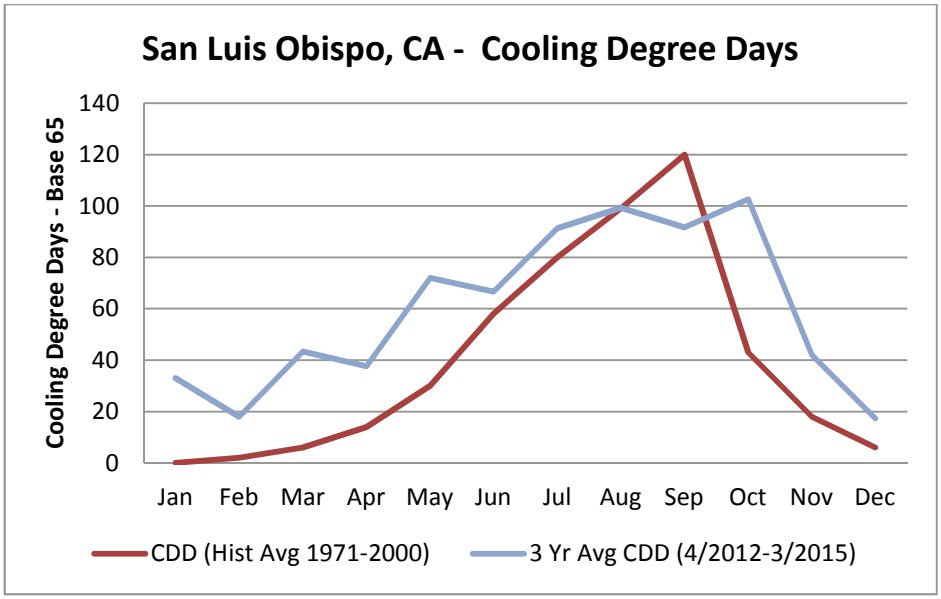
Weather Data

In order to calibrate a building energy simulation model, the proper weather data set must be selected. The weather data must be local to the site and be an average over a significant period of time to reduce the effect of weather abnormalities that can be associated with a specific year. For this calibration process, the PG&E SST team imported the typical meteorological year (TMY3) data from the National Renewable Energy Laboratory (NREL) to the HAP program for the San Luis Obispo Regional Airport, which is an average of 1991-2005 weather data. This NREL data set includes hourly temperatures, humidity, solar radiation, pressures and other key information that is used by HAP to determine the effect of weather on the cooling and heating loads.

In addition, the PG&E SST team reviewed the heating and cooling degree days with respect to the historical average and the last three years. The heating degrees days (HDD) are shown below and indicate that over the last part of 2012 though the beginning of 2015, it was colder than the historical average and required more heating degree days, thus more heating. However, this period also indicates that after 2012 the trend is towards decreasing HDDs towards the historical average and translates to a warming trend.



The cooling degrees days (CDD) are shown below and indicate that trend for the shoulder months is increased CDDs (or a warming trend) which requires more cooling. However, the peak summer month (September) is trending cooler and requires less CDDs than the historical average.



Based on comparisons, the TMY3 data is an adequate weather data to simulate the energy balance for the buildings in San Luis Obispo, CA.

Carrier HAP Output and Results Validation

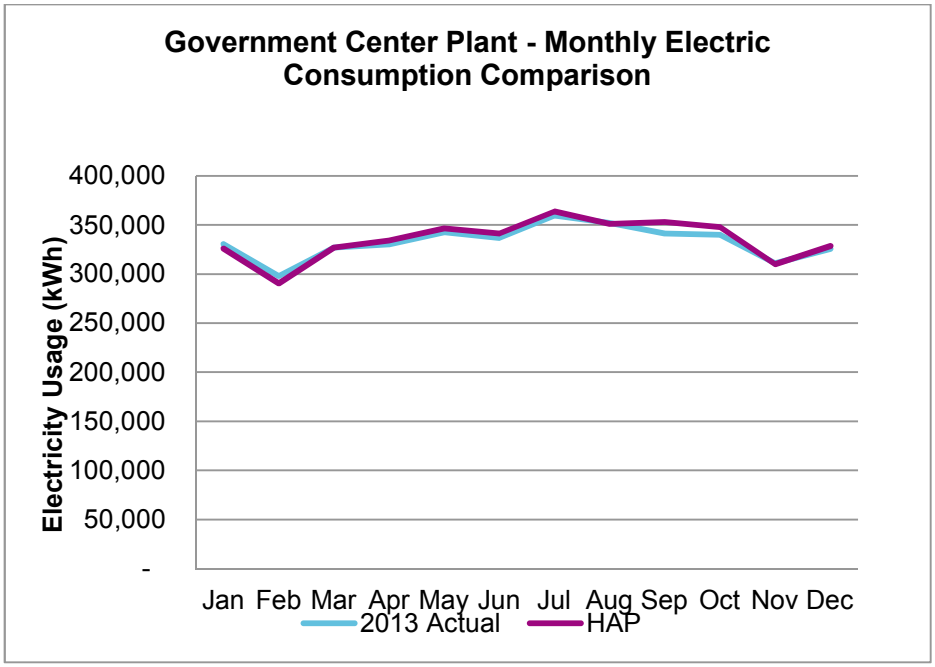
For the Government Center Complex Plant, the estimated cooling and heating loads are validated by examining two different references. First,

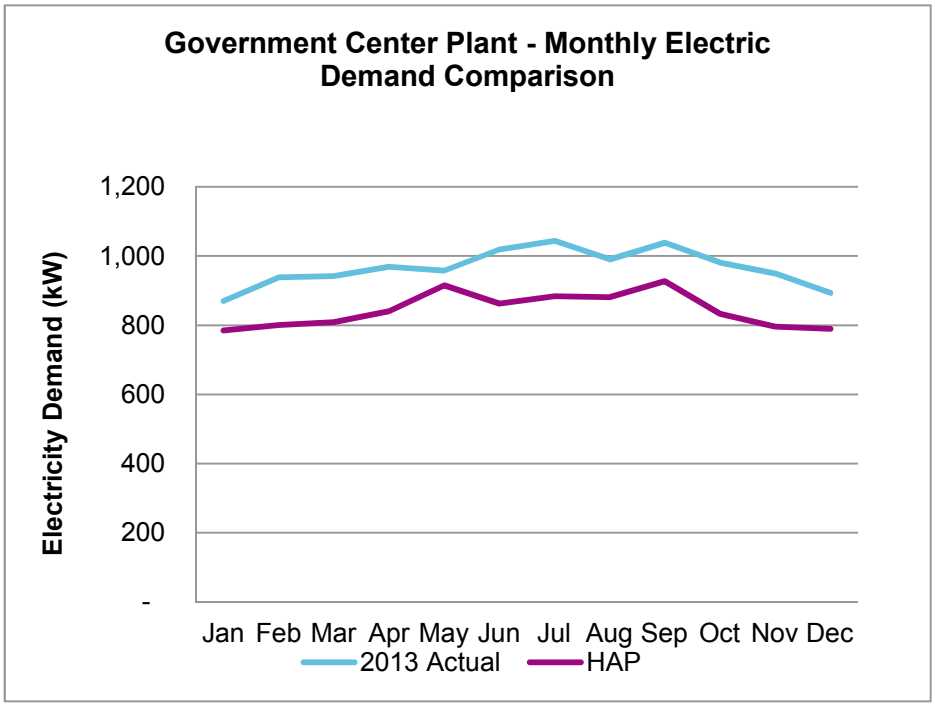
the estimated cooling and heating loads were compared to the actual design capacities found from the design drawings and boilerplate information collected from the site visit. Both cooling and heating load estimates stayed within 5% of the design capacity of each system as summarized below:

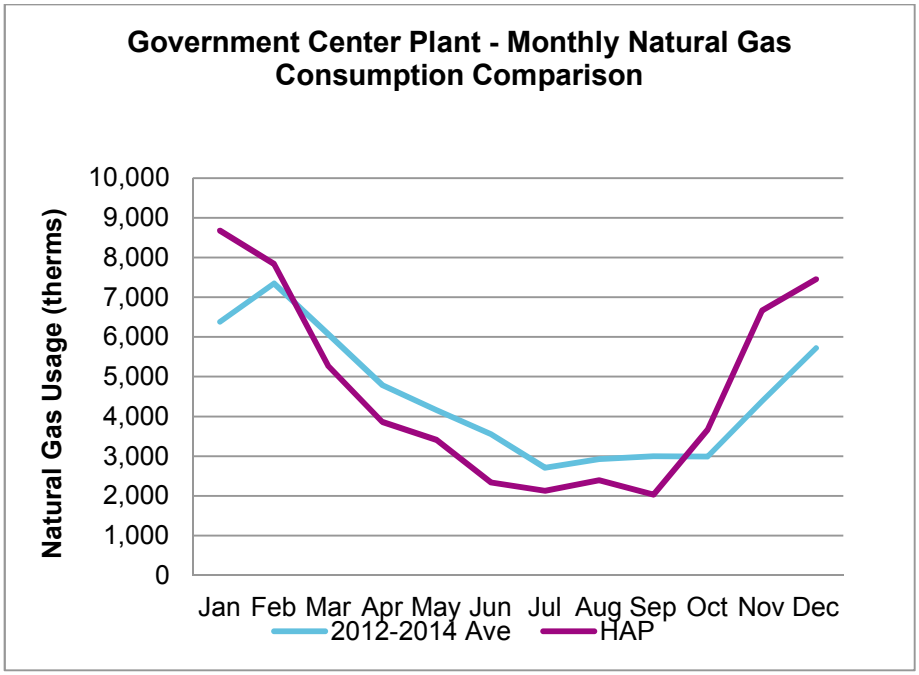
	Cooling Load (Tons)	Heating Load (MBtuh)
Design Capacity	435.0 Tons	2,550 MBtuh
Modeled Load	449.0 Tons	2,448 MBtuh
Deviation (%)	3.2%	-4.0%

Considering a typical safety factor of 10-15% as a conservative sizing practice, less than 10% deviation means a relatively close estimate as far as design capacity is concerned. Based on the estimated cooling and heating loads, both cooling and heating systems seem to be adequate to carry the required loads. However, since the model utilizes the TMY3 weather data, when there is an extreme weather condition, the buildings can experience under-cooling and/or under-heating.

Secondly, the estimated electricity and natural gas consumption, and electric demand, from the energy model were compared to the actual electricity consumption and electric demand during FY 2013 and the average natural gas consumptions during Jan 2012 – Apr 2014. The results are shown in the Monthly Electric Consumption Comparison, Monthly Electric Demand Comparison and Monthly Natural Gas Consumption Comparison charts.

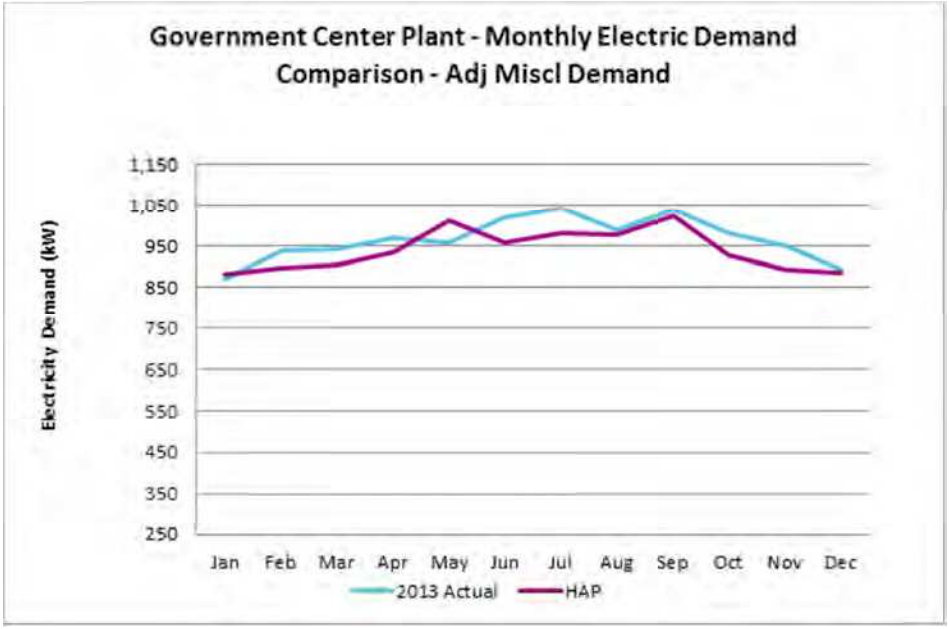

Government Center Plant - Monthly Electric Consumption Comparison
Electricity Usage (kWh)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
-
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2013 Actual
HAP


Government Center Plant - Monthly Electric Demand Comparison
Electricity Demand (kW)
1,200
1,000
800
600
400
200
-
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2013 Actual
HAP



For electric consumption (kWh), the annual deviation is less than 1% with all months less than 4%. For the electric demand (kW), the monthly deviation is within +/- 15% or less, except for November which is at a 16% deviation. For the natural gas consumption (therms), the annual deviation is 3% of the average annual usage. In general, the profile curve is similar to the average profile although the monthly deviation is greater than +/- 15%. This deviation appears to be more related to non-heating use, such as domestic hot water usage.

As noted, the current model shows the demand at a fairly consistent deviation of approximately 15% below the actual reported demand. Since this is fairly consistent and does not fluctuate significantly per month, this means that the deviation is due to non-weather/non-HVAC related demand. Based on this and that we used a relatively low number for the miscellaneous electric load category (computers, task lighting, standard office equipment, etc.), raising it to a value that is not unusual for modern multi use facilities (approximately 0.75 Watts per square foot), brings the demand generally within the range of +/- 1% to +/-6% on a monthly basis and within 3% on an annual basis. It is not envisioned that this demand change would affect the consumption (kWh) results, as it would not be a continuous load throughout the day and, therefore, would not affect the validity of the model as it applies to the HVAC analysis. The “new” demand curve would be similar to the “Adj Miscl Demand” shown below.



Since the electricity consumption deviation is less than 1% of the actual consumption on an annual basis, and the electric demand is within +/- 15% on a monthly basis, it means the model is a reasonably close to the actual energy balance of the building and therefore calibrated. For the natural gas evaluation, since the majority of the deviation outliers are in the warmer months, where the calculated usage is less than the actual, it appears that the difference is attributed more to domestic water heating vs. comfort heating. Therefore, the natural gas model is deemed to be acceptable for the evaluation of the comfort heating.

Once the baseline run is complete, individual ECM runs were created by changing the applicable input, such as efficiency (kW/ton for chillers), power and motor efficiency for pumps, and power to flow relationship for variable speed applications (watts per gpm for pumps). Each ECM was run independently, so as to not have any unintended interaction between runs. For the Government Center Complex, the final models included the chiller upgrade, chilled water variable flow and heating hot water variable flow.

Please refer to Appendix C for the calibration, baseline and ECM analysis results.

Scope of Work

The central plant upgrade (chiller installation, piping modifications, and electrical) scope of work will include:

- Install two (2) Daikin/Turbocor 250 Ton (nominal, or equal) magnetic bearing, R134A, centrifugal chillers. Chillers were

sized using the TMY3 data as discussed above, which gave a peak load of 449 tons.

- Demolish and dispose of existing 150 and 250 Ton Trane Centrifugal chillers and the 160 Ton Thermax absorber, existing primary pumps
  - Shut isolation valves to pumps and chiller evaporator and condenser
  - Drain water and properly dispose
  - Disconnect power to units
- Rig Chillers through large wall louver located at the alley side of the chiller room. The new chillers will fit in the existing chiller room area.
- Existing pads can be reused for chillers but the condition should be verified. Pads may be able to be extended with dowels, etc.
- Provide and install two (2) primary CHW pumps (estimated at 600 gpm, 50 feet of head)
- 8”, 10”, and 12” piping modifications to tie into existing primary chiller supply and return piping
- Provide and install 8” S and R piping with stub out connections for future 300 Ton machine
- Provide and install vibration isolation and seismic anchorage of chillers and pumps
- Provide and install butterfly shut off valves, all required bypass valves, fittings, temperature and pressure gauges, Pete’s plugs, etc.
- Provide new expansion tank and air separator for CHW system
- Provide and install insulation and repair any damaged insulation
- At this time removal and demolition or salvage of the (3) existing non-operational cogen units is not included in this scope of work, as the costs relative to this work do not provide any energy savings. The PG&E SST team has received a proposal from their Mechanical subcontractor for this demo work, and as such this scope could be added if the County would like.
- Upgrade chemical treatment

- Upgrade refrigerant alarm and exhaust system as per ASHRAE 15 requirements
- Install Delta controls to interface with existing system to control the chillers, primary pumps, condenser water pumps, secondary and booster pumps as well as cooling tower fans. Control package will include chiller sequence of operation, pump system VFD programming to be tied to various DP sensors or chiller and tower operation, Cooling tower sequence of operation, programming logic and graphics to be displayed at the County facilities operations head end EMCS.

This project will include new control devices and programming to provide for fully functional CHW, CDW (Condenser Water) and HHW systems that operate automatically in a very efficient manner. The scope outlined herein shall utilize the existing “Delta Controls” EMCS. In addition, new equipment shall be BACnet compatible for compliance with the Owner’s standards to help ensure or maintain a reliable network for future control upgrades. Programming costs for ECMs 2 & 3 are covered in this measure as the programming will be done as one sequence of operations, while the hardware costs for ECMs 2 & 3 such as valves and installation are included in ECMs 2 & 3. Training will be provided to Facilities Maintenance personnel after programming and installation are complete. Specifically, the controls scope of work shall include:

a) The Controls Contractor shall provide all new control devices including controllers, sensors, transducers, and switches to name a few that are necessary to meet the requirements of the new optimization sequences. Existing control devices that are in good working order can be reused. All programming and commissioning of the new sequences within the existing Delta Controls system is by the Controls Contractor. In addition, all controller terminations will be the responsibility of the Controls Contractor.

b) The Controls Contractor shall be primarily responsible for installing new conduit and low voltage wiring including sensor wiring, equipment control panel wiring, RS485 network wiring and CAT5/5E Ethernet cable as needed to meet the project requirements. Elements of this scope include the following:

   i) During demolition phase – peel back and safeguard existing sensor wiring that will be re-used for equipment that will be replaced (e.g. chillers)

   ii) Rewire control cables as needed to existing control devices and equipment.

iii) Install new conduit (as necessary) and wire to new control devices. Terminations to the existing Delta controllers shall be performed by the Controls Contractor.

c) Demolition – It is the responsibility of the Controls Contractor to remove all control points and associated programming from the existing Delta Controls EMCS for equipment that will be removed from the Central Plant and will no longer exist (e.g. cogeneration system, CH-3, Heat Recovery System [HX-1], etc.). To help ensure reliability and stability of the remaining EMCS, all points and programming associated with equipment being eliminated must be removed from the database.

Remove obsolete control cabling from control panel terminations. Where appropriate, fully remove obsolete or disconnected control cabling from EMCS controllers, enclosures and conduit.

d) BTU Meters – Two existing Onicon "System-10" BTU meters are currently installed in the plant. Each BTU meter is comprised of a pair of factory calibrated matched temperature sensors, an insertion style electromagnetic F-3500 Series flow meter and a control panel with LCD display. These BTU meters monitor the following:

- Heat recovery from HX-1. The flow meter and temperature sensors are installed in the 4" HHW supply and return lines serving HX-1.
- Chilled water from CH-3. The flow meter and temperature sensors are installed in the 6" CHW supply and return lines serving CH-3.

These two (2) BTU meters shall be re-used for the two (2) new chillers and devices mounted on the CHW supply and return lines.

i) Prior to pipe demolition, safely disconnect and safeguard all sensor (temperature sensors and flow meter) wiring for future use. Remove sensing devices and set aside in a safe and secure area for future use.

ii) Provide new calibration of existing devices (e.g. flow meters and BTU panels). Per manufacturer, devices can be reprogrammed to accommodate new operating parameters (e.g. flow ranges) and can be re-configured for different pipe sizes. Contact Onicon for details including updated software and new calibration labels.

iii) Coordinate with Mechanical Contractor to remove existing mounting kits (i.e. ball valves & nipple fittings) associated for each of the BTU sensing devices for re-use in the new chiller piping.

iv) For each of the new chillers, Mechanical Contractor to reinstall mounting kits in new dedicated chiller CHW piping per Onicon's recommendations (e.g. flow meter location should have 10 pipe diameters upstream / 5 pipe diameters downstream of straight pipe; reference installation manual).

v) Reinstall existing sensing devices thru associated installation kits and into new CHW pipe.

vi) Relocate existing “CHW” BTU Control Panel to location near CH-1. Similarly, relocate existing “HW” BTU Control Panel to location near CH-2. Coordinate locations with the PG&E SST project manager and facility personnel. Extend existing 120V power source for each device as necessary.

vii) Reinstall control wiring between pipe sensors (temperature and flow) and BTU Control Panel.

viii) Reinstall Cat-5 Ethernet cable to BTU Control Panel. BTU Control Panel shall integrate to the existing Delta EMCS via BACnet IP communication. The following points should be made visible in the EMCS for each chiller: CHW Flow; Tonnage; Ton-Hours; CHW Supply Temperature and CHW Return Temperature.

ix) Provide new control cable from Delta Control Panel to each BTU Control Panel for the following hardwired points:

(1) CH-1 CHW flow (AI)
(2) CH-1 Tonnage (AI) – Contractor to confirm with Onicon if output point is available. Device Serial Number is 200299.
(3) CH-2 CHW flow (AI)
(4) CH-2 Tonnage (AI) – Contractor to confirm with Onicon if output point is available. Device Serial Number is 200300.

x) Provide new instrument tags “CH-1” and “CH-2”

e) Flow Meter – An existing Dynasonic TFXL ultrasonic flow meter is currently installed on the Cogeneration system’s high temperature jacket water loop. This flow meter shall be removed and reused for the secondary CHW loop.

i) Prior to pipe demolition, safely disconnect and safeguard sensor (flow meter) wiring for future use. Remove ultrasonic sensing transducers from pipe and set aside in a safe and secure area for future use.

ii) Reconfigure existing device for new application. Per manufacturer, devices can be reprogrammed to accommodate new operating parameters (e.g. flow ranges) and can be reconfigured for different pipe size. Contact manufacturer (Badger Meter) for additional details.

iii) Reinstall existing flow meter sensing transducers onto secondary loop CHW pipe in a location with sufficient straight pipe per the manufacturer’s instructions (e.g. flow meter location should have 10 pipe diameters upstream / 5 pipe diameters downstream of straight pipe; reference installation manual).

iv) Extend existing control signal wiring and power wiring as necessary.

v) Reinstall wiring between pipe transducers and flow meter.

f) Chilled Water System

i) Furnish the following equipment to be installed by Mechanical Contractor:
(1) Two new [2] differential pressure sensors with manifolds for DP measurement. Install across each of the two [2] new chiller's condenser. These will be used to calculate each chiller's CDW flow.
(2) Stainless steel temperature thermowells for temperature sensors as indicated.
(3) New Onicon electromagnetic insertion style flow meter and associated installation kit (ball valve and nipple). This flow meter will be connected to the existing EMCS system and data generated from the meter could be stored and accessed electronically.
(4) All new 2-Way CHW control valves as identified in the Mechanical RFP dated 3/30/2015 titled "Central Plant Upgrades at Downtown Campus – Central Plant". Reference Addendum-2 for quantities.
(5) Two new [2] differential pressure sensors with manifolds for CHW DP measurements in Library and Annex buildings. Reference Mechanical RFP dated 3/30/2015 titled "Central Plant Upgrades at Downtown Campus – Central Plant" and associated Addendum-1.

ii) Chillers - Provide material, programming and integration to the existing EMCS for the following points: (Note - (E) is existing point; (N) is a new point)
(1) Chiller CH-1:
(a) Hardwired Points:
(i) (E) Chiller Enable / Disable (BO)
(ii) (N) Chiller Run Status (BI)
(iii) (E) Chiller Supply Temperature Set Point (AO)
(iv) (N) CHW Flowrate (AI) – See Note Below
(v) (E) CHW Supply Sensor (AI) – See Note Below
(vi) (N) CHW Return Sensor (AI) – See Note Below
(vii) (N) CDW Supply Sensor (AI)
(viii) (E) CDW Return Sensor (AI)
(ix) (N) Condenser DP sensor (AI)
(x) (E) CHW Isolation Valve (BO)
(xi) (E) CDW Isolation Valve (BO)

(b) BACnet Integration Control / Monitoring Points:
(i) Fault/Alarm Status
(ii) Chiller Power
(iii) % Load
(iv) Others – TBD, Identified by Owner

(2) Chiller CH-2:
(a) Hardwired Points:
(i) (E) Chiller Enable / Disable (BO)

(ii) (N) Chiller Run Status (BI)
(iii) (E) Chiller Supply Temperature Set Point (AO)
(iv) (N) CHW Flowrate (AI) – See Note Below
(v) (E) CHW Supply Sensor (AI) – See Note Below
(vi) (N) CHW Return Sensor (AI) – See Note Below
(vii) (N) CDW Supply Sensor (AI)
(viii) (E) CDW Return Sensor (AI)
(ix) (N) Condenser DP sensor (AI)
(x) (E) CHW Isolation Valve (BO)
(xi) (E) CDW Isolation Valve (BO)

(b) BACnet Integration Control / Monitoring Points:
(i) Fault/Alarm Status
(ii) Chiller Power
(iii) % Load
(iv) Others – TBD, Identified by Owner

Note: The existing Onicon BTU meter may have optional analog signals available for CHW flow, CHW supply and CHW return temperatures as well as energy (tonnage). If the BTU meter does not have the analog outputs, then wire directly to the F-3500 meter using its isolated analog output signal. In addition, provide temperature sensors as indicated.

iii) Variable Volume CHW Pumps: Provide material, programming and integration from VFD to the existing EMCS for the following:

(1) One [1] **new** secondary CHW pump VFD connections to the EMCS with the following points (Serves Library):

(a) Hardwired Points:
(i) (E) Pump CP-8 Start / Stop (BO)
(ii) (E) Pump CP-8 Status. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)
(iii) (N) Pump CP-8 Speed Set Point (AO)

(b) BACnet Integration Control / Monitoring Points:
(i) Power
(ii) Fault
(iii) Communication Failure
(iv) Others – TBD, Identified by Owner

(2) One [1] **new** tertiary CHW pump VFD connections to the EMCS with the following points (Serves Annex, new Booster Pump):

(a) Hardwired Points:
(i) (N) Pump CP-X Start / Stop (BO)
(ii) (N) Pump CP-X Status. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)

(iii) (N) Pump CP-X Speed Set Point (AO)

(b) BACnet Integration Control / Monitoring Points:
(i) Power
(ii) Fault
(iii) Communication Failure
(iv) Others – TBD, Identified by Owner

(3) Two [2] **existing** primary CHW pump VFD connections to the EMCS with the following points for each (Pumps CP-1 & CP-1A):

(a) Hardwired Points:
(i) (N) Pump Start / Stop (BO)
(ii) (N) Pump Status by Current Switch. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)
(iii) (E) Pump Speed Set Point (AO)

(4) One [1] **existing** secondary CHW pump VFD connection to the EMCS with the following points each (Serves Old Courthouse):

(a) Hardwired Points:
(i) (N) Pump CP-4 Start / Stop (BO)
(ii) (E) Pump CP-4 Status (BI)
(iii) (E) Pump CP-4 Speed Set Point (AO)

(5) One [1] **existing** secondary CHW pump VFD connection to the EMCS with the following points each (Serves Old Government Center & Annex):

(a) Hardwired Points:
(i) (N) Pump CP-12 Start / Stop (BO)
(ii) (E) Pump CP-12 Status (BI)
(iii) (E) Pump CP-12 Speed Set Point (AO)

iv) Miscellaneous Control: In addition to the existing CHW System points that are to remain in place (e.g. CHW building return temperatures, secondary CHWS & CHWR temperatures, CHW primary flow, etc.) provide material, programming and integration to the EMCS for the following new CHW System points:

(1) Provide One [1] CHW “Bridge” Temperature Sensor (AI)

(2) Provide One [1] Secondary CHW Flow Meter (AI) – There are currently two [2] secondary CHW loops. One loop serves the new Government Center and the other serves the remaining buildings. The existing Dynasonic TFXL flow meter described above will monitor one CHW loop and a new meter will be required to monitor the second CHW loop. Provide Onicon F3500 Series electromagnetic meter.

(3) Provide One [1] CHW Bypass Control Valve (AO) – This valve will be sized to provide minimum flow thru one new chiller (estimated 3").

(4) Refrigerant Monitoring System: Provide one [1] trouble alarm (BI) and one [1] high level alarm (BI).

v) Provide new analog output (AO) control points for all new 2-Way CHW control valves for buildings served by central plant as identified in the Mechanical RFP dated 3/30/2015 titled "Central Plant Upgrades at Downtown Campus – Central Plant" and associated Addendums.

vi) Provide two [2] new analog input (AI) control points for new CHW differential pressure sensors installed for Library and Annex buildings. Sensors to be terminated to closest Delta Controls controller with the latest firmware version.

g) Heating Hot Water System

i) Furnish the following equipment to be installed by Mechanical Contractor:

(1) Stainless steel temperature thermowells for temperature sensors as indicated.

(2) All new 2-Way CHW control valves as identified in the Mechanical RFP dated 3/30/2015 titled "Central Plant Upgrades at Downtown Campus – Central Plant". Reference Addendum-2 for quantities.

(3) Two new [2] differential pressure sensors with manifolds for HHW DP measurements in Library and Annex buildings. Reference Mechanical RFP dated 3/30/2015 titled "Central Plant Upgrades at Downtown Campus – Central Plant" and associated Addendum-1.

ii) Boilers - Provide material, programming and integration to the existing EMCS for the following points:

(1) Boiler B-1 (Existing):
(a) Hardwired Points:
(i) (E) Boiler Enable / Disable (BO)
(ii) (N) Boiler Run Status (BI)
(iii) (N) Boiler Alarm (BI)
(iv) (E) Boiler Supply Temperature Set Point (AO)
(v) (E) Boiler Isolation Valve (BO)
(vi) (N) Boiler Supply Temperature Sensor (AI)

(2) Boiler B-2 (Existing):
(a) Hardwired Points:
(i) (E) Boiler Enable / Disable (BO)
(ii) (N) Boiler Run Status (BI)
(iii) (N) Boiler Alarm (BI)
(iv) (E) Boiler Isolation Valve (BO)

(v) (N) Boiler Supply Temperature Sensor (AI)

iii) Constant Volume HHW Pumps (Existing):
(1) (E) HHW CP-5 Enable / Disable (BO)
(2) (N) HHW CP-5 Run Status (BI)
(3) (E) HHW CP-6 Enable / Disable (BO)
(4) (N) HHW CP-6 Run Status (BI)

iv) Variable Volume HHW Pumps: Provide material, programming and integration from VFD to the existing EMCS for the following HHW Distribution Pumps:

(1) One [1] **new** secondary HHW pump VFD connections to the EMCS with the following points (Serves Library):
(a) Hardwired Points:
(i) (E) CP-7 Pump Start / Stop (BO)
(ii) (E) CP-7 Pump Status. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)
(iii) (N) CP-7 Speed Set Point (AO)

(b) BACnet Integration Control / Monitoring Points:
(i) Power
(ii) Fault
(iii) Communication Failure
(iv) Others – TBD, Identified by Owner

(2) One [1] **new** tertiary HHW pump VFD connection to the EMCS with the following points each (Serves Annex, new Booster Pump):
(a) Hardwired Points:
(i) (N) CP-X Pump Start / Stop (BO)
(ii) (N) CP-X Pump Status. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)
(iii) (N) CP-X Speed Set Point (AO)

(b) BACnet Integration Control / Monitoring Points:
(i) Power
(ii) Fault
(iii) Communication Failure
(iv) Others – TBD, Identified by Owner

(3) One [1] **existing** secondary HHW pump VFD connection to the EMCS with the following points each (Serves Old Courthouse):
(a) Hardwired Points:
(i) (N) CP-3 Pump Start / Stop (BO)
(ii) (N) CP-3 Pump Status (BI)
(iii) (E) CP-3 Speed Set Point (AO)

(4) One [1] **existing** secondary HHW pump VFD connection to the EMCS with the following points each (Serves Old Government Center & Annex):
(a) Hardwired Points:
(i) (N) CP-11 Pump Start / Stop (BO)
(ii) (E) CP-11 Pump Status (BI)
(iii) (E) CP-11 Speed Set Point (AO)

v) Miscellaneous Control: In addition to the existing HHW System points that are to remain in place (e.g. HHW building return temperatures, Common HHWS temperature, HHW primary flow status, etc.) provide material, programming and integration to the EMCS for the following new HHW System points:

(1) Provide One [1] Common HHW Return Temperature Sensor (AI)

vi) Provide new analog output (AO) control points for all new 2-Way CHW control valves for buildings served by central plant as identified in the Mechanical RFP dated 3/30/2015 titled “Central Plant Upgrades at Downtown Campus – Central Plant” and associated Addendums.

vii) Provide two [2] new analog input (AI) control points for new CHW differential pressure sensors installed for Library and Annex buildings. Sensors to be terminated to closest Delta Controls controller with latest firmware version.

h) Condenser Water System

i) Furnish the following equipment to be installed by Mechanical Contractor:

(1) Stainless steel temperature thermowells for temperature sensors as indicated.

ii) Miscellaneous Control: In addition to the existing CDW System points that are to remain in place (e.g. common CDW supply temperature, HX CDW outlet temperature, cooling tower isolation valves, etc.) provide material, programming and integration to the EMCS for the following new CDW System points:

(1) Provide One [1] new Common CDW Return Temperature Sensor (AI)

iii) Variable Volume CDW Pumps: Provide material and programming from two [2] **existing** VFD(s) to the EMCS for each CDW Pump (CP-2 & CP-2A):

(a) Hardwired Points:
(i) (N) Pump Start / Stop (BO)
(ii) (N) Pump Status by Current Switch. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)
(iii) (E) Pump Speed Set Point (AO)

iv) Cooling Tower Fans: Provide material and programming from two [2] **existing** VFD(s) to the EMCS for each Cooling Tower (CT-1 & CT-2):

(b) Hardwired Points:
(i) (N) Pump Start / Stop (BO)
(ii) (N) Pump Status by Current Switch. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)
(iii) (E) Pump Speed Set Point (AO)

i) Network: Install new BACnet MS/TP (RS485) network cable between new ABB VFD controllers, new chillers, and the main EMCS controller. Wiring must be installed in daisy chain configuration. Absolutely, no T-Taps or splices allowed.

ECM Benefits

- Electrical energy savings.
- Increased redundancy with multiple compressors per chiller.
- Reduced chiller maintenance costs.

ECM 7 Chiller Replacement - Health Center

Existing Conditions

Health Center

Cooling for the Health Center is currently provided by a small 30-ton (nominal) air cooled chiller and a 90 ton (nominal) air cooled chiller on a flatbed trailer. The chilled water is distributed throughout the building on a variable flow loop. The speed of the two 5 horsepower CHW pumps is controlled by variable frequency drives based on building load. Control and monitoring of the system is provided by the Delta Energy Management and Control System (EMCS).

Cooling for the building is provided in three stages based on building load:

1. Cooling tower water is run through a plate and frame heat exchanger to provide “free” cooling to the chilled water loop. The economizer mode using the cooling tower and heat exchanger is enabled when there is a call for cooling (i.e., chilled water pumps are on) and the outside wet bulb temperature is less than 5 degrees below the chilled water return temperature (56F).
2. After the delta T rises above the threshold, the smaller chiller is enabled and operates to provide cooling for the buildings. The threshold for enabling a chiller is when the either the return chilled water temperature is greater than 2-5 degrees above the desired return temperature (56F) for a set period of time (such as 15 minutes) or the chilled water supply temperature is above its set-point (42F) by 2-5 degrees for a set period of time.
3. After the delta T rises above the threshold (above), the larger chiller is enabled and provides cooling for the buildings, and the smaller chiller is disabled.
4. If the delta T continues to rise above the threshold, then both chillers are enabled and provide cooling for the buildings.

ECM Description

Water cooled chillers utilizing the existing cooling tower would be much more efficient than the current chillers. A variable speed, magnetic

bearing, chiller would provide excellent part load efficiency and decreased maintenance requirements. The scope would include:

- Demolish and remove existing 30 and 90 ton air cooled chillers. Salvage and sell any large equipment if possible.
- Remove existing gas fired absorption chillers to provide space for the new chiller
- Install (2) two 100 Ton (nominal) Daikin/Turbocor, R-134a, centrifugal chillers
- Connect required piping to building and condenser water loops
- Replace the existing primary chilled water and condenser water pumps
- Integrate Controls to the EMCS

Cooling and Heating Load Calculations

Energy savings for the County of San Luis Obispo Heath Center were determined by the PG&E SST team using the Carrier Hourly Analysis Program using the same methodology described for the Government Center Complex plant.

Carrier HAP Output and Results Validation

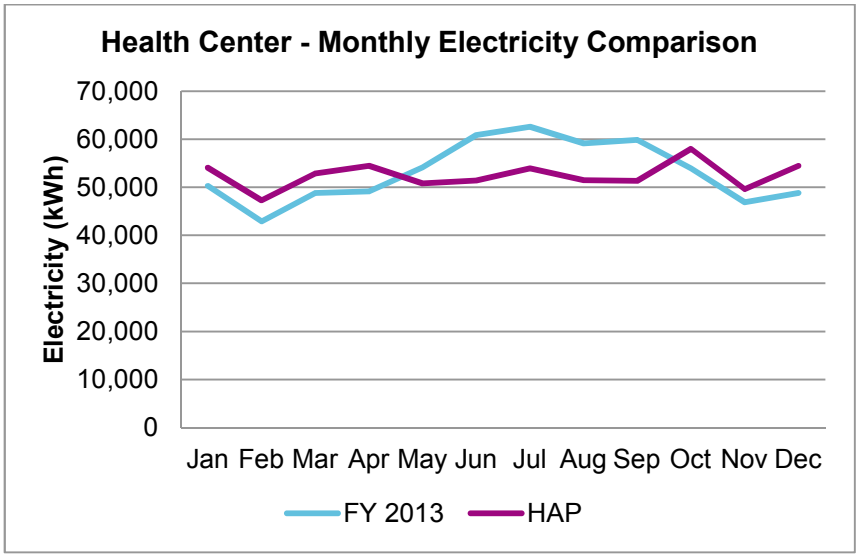
The estimated cooling and heating loads are validated by examining two different references. First, the estimated cooling and heating loads were compared to the actual design capacities found from the design drawings and boilerplate information collected from the site visit. Both cooling and heating load estimates stayed within 15% of the design capacity of each system as summarized below:

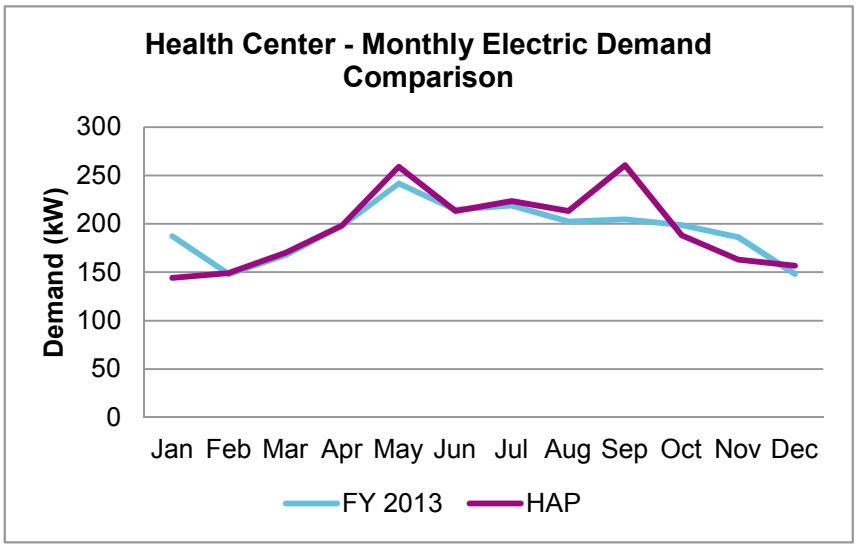
	Cooling Load (Tons)	Heating Load (MBtuh)
Design Capacity	153 Tons	1,260 MBtuh
Modeled Load	136 Tons	1,312 MBtuh
Deviation (%)	12%	4.0%

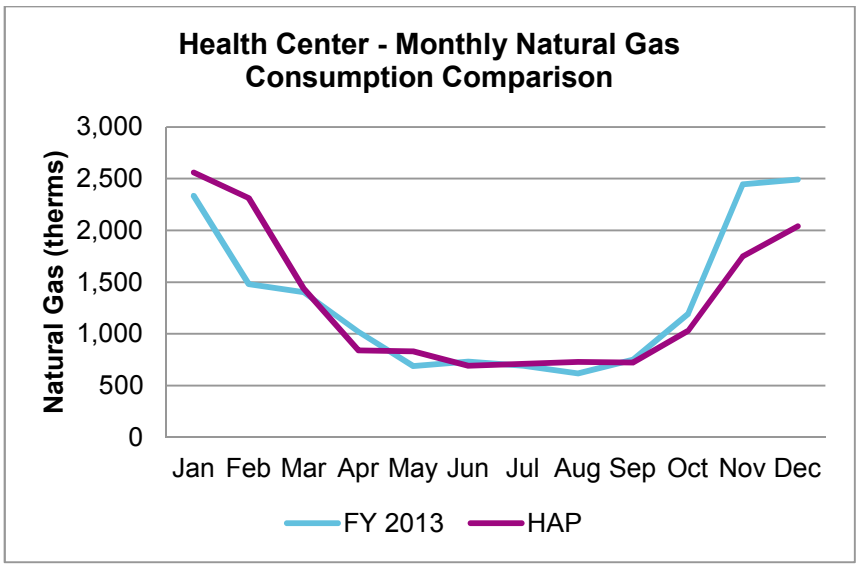
Considering a typical safety factor of 10-15% as a conservative sizing practice, the deviation means a relatively close estimate as far as design capacity is concerned. Based on the estimated cooling and heating loads, both cooling and heating systems seem to be adequate to carry the required loads. However, since the model utilizes the TMY3

weather data, when there is an extreme weather condition, the buildings can experience under-cooling and/or under-heating.

Secondly, the estimated electricity and natural gas consumption, and electric demand, from the energy model were compared to the actual electricity consumption, electricity demand, and natural gas consumption during FY 2013, as received from the County accounting office. The results are shown in the Monthly Electric Consumption Comparison, Monthly Electric Demand Comparison and Monthly Natural Gas Consumption Comparison charts.







For electric consumption (kWh), the annual deviation is less than 2% with all months less than 15%, except for three summer months (June, July and September) that are between 16-18%. For the electric demand (kW), the monthly deviation is within +/- 15% or less, except for two months (September and January) that are in the mid to upper 20%. For the natural gas consumption (therms), the annual deviation is less than 2% with the monthly deviation generally within +/- 15%, except for a few outlier months (February, April, November and December).

When comparing the results of the model with the one year's worth of utility data, the annual deviations were within 1.5%, with the majority of the months less than 15%. As a result, it was determined that the models are reasonably close to the actual energy balance of the building and therefore calibrated, and the model was sufficiently accurate and provided realistic savings.

Once the baseline run is complete, the individual ECM runs were created by changing the applicable input, such as efficiency (kW/ton for chillers), power and motor efficiency for pumps, and power to flow relationship for variable speed applications (watts per gpm for pumps). Each ECM was run independently, so as to not have any unintended interaction between runs. For the Health Center, the final model addressed the chiller upgrade, although other runs, such as heating hot water improvements were investigated. The savings for the HHW Pumping is the result of upgraded control of the HHW system that will include optimization by scheduling, temperature setback and lockout.

Please refer to Appendix D for the calibration, baseline and ECM analysis results.

Scope of Work

The central plant upgrade (chiller installation, piping modifications, and controls) scope of work will include::

- Install two (2) Daikin/Turbocor 100 Ton (nominal, or equal) magnetic bearing, R134A, centrifugal chillers with new concrete pads
- Disconnect piping at chillers/heaters and remove chillers/heaters, the two air cooled chillers and corresponding pumps.
- Install two new 150 GPM, 30 ft HD (estimated), 2 HP, super premium efficient, B&G 1531, close coupled, end suction, chilled water pumps
    - Install new pump suction and discharge piping, as needed, connect to existing 6 inch diameter header and include taps and valves for future back-up pump. Install new strainer and isolation valves.
    - Connect power to existing “disconnect” after verification that “disconnect” and existing cables/breaker are sufficient, otherwise replace, as necessary.
- Install two new 205 GPM, 50 ft HD (estimated), 5 HP, super premium efficient, inverter rated, B&G 1531, close coupled, end suction, condenser water pump,
    - Install new pump suction and discharge piping, as required, connect to existing 6 inch diameter header and include taps and valves for future back-up pump,
    - Install new strainer and isolation valves,
    - Connect power to existing VFD and “disconnect” after verification that VFD, “disconnect” and existing cables/breaker are sufficient, otherwise replace, as necessary.
- Install new chilled water supply and return piping and connect to existing 6 inch diameter supply and return header on the primary side of the decoupler with new butterfly valves at the evaporator (valve at evaporator discharge to be automatic modulating type to allow flow adjustment and/or shut off when not in use),
- Install new condenser water supply and return piping (inlet diameter is 4 inches) and connect to existing 6 inch diameter supply and return header with new butterfly valves (valve at

condenser inlet to be automatic type to allow shut off when not in use),

- Replace existing breaker with new breaker or route new power from another panel,
- Provide new conduit and wire, as necessary.

This project will include new control devices and programming to provide for fully functional CHW, CDW and HHW systems that operate automatically in a very efficient manner. The scope outlined herein shall utilize the existing "Delta Controls" EMCS. In addition, new equipment shall be BACnet compatible for compliance with the Owner's standards to help ensure or maintain a reliable network for future control upgrades. Specifically, the controls scope of work shall include:

a) The Controls Contractor shall provide all new control devices including controllers, sensors, transducers, and switches to name a few that are necessary to meet the requirements of the new optimization sequences. Existing control devices that are in good working order can be reused. All programming and commissioning of the new sequences within the existing Delta Controls system is by the Controls Contractor. In addition, all controller terminations will be the responsibility of the Controls Contractor.
b) The Controls Contractor shall be primarily responsible for installing new conduit and low voltage wiring including sensor wiring, equipment control panel wiring, RS485 network wiring and CAT5/5E Ethernet cable as needed to meet the project requirements. Elements of this scope include the following:
   i) During demolition phase – peel back and safeguard existing sensor wiring that will be re-used for equipment that will be replaced (e.g. chillers)
   ii) Rewire control cables as needed to existing control devices and equipment.
   iii) Install new conduit (as necessary) and wire to new control devices. Terminations to the existing Delta controllers shall be performed by the Controls Contractor.
c) Demolition – It is the responsibility of the Controls Contractor to remove all control points and associated programming from the existing Delta Controls EMCS for equipment that will be removed from the Central Plant and will no longer exist. To help ensure reliability and stability of the remaining EMCS, all points and programming associated with equipment being eliminated must be removed from the database.
   Remove obsolete control cabling from control panel terminations. Where appropriate, fully remove obsolete or disconnected control cabling from EMCS controllers, enclosures and conduit.
d) Chilled Water System
   i) Furnish the following equipment to be installed by Mechanical Contractor:

(1) Two [2] new differential pressure sensors with manifolds for DP measurement. Install across each of the two [2] new chiller's condenser. These will be used to calculate each chiller's CDW flow.
(2) Two [2] new in-line electromagnetic flow meters – Siemens SITRANS F M MAGFLO 5100W Series with remote display or equal. Install to monitor flow in each new chiller's evaporator.
(3) Stainless steel temperature thermowells for temperature sensors as indicated.
(4) New Onicon electromagnetic insertion style flow meter and associated installation kit (ball valve and nipple).

ii) Chillers - Provide material, programming and integration to the existing EMCS for the following points: (Note - (E) is existing point; (N) is a new point)
(1) Chiller CH-1:
(a) Hardwired Points:
(i) (E) Chiller Enable / Disable (BO)
(ii) (N) Chiller Run Status (BI)
(iii) (N) Chiller Supply Temperature Set Point (AO)
(iv) (N) CHW Flowrate (AI)
(v) (E) CHW Leaving Sensor (AI)
(vi) (N) CHW Entering Sensor (AI)
(vii) (E) CDW Leaving Sensor (AI)
(viii) (E) CDW Entering Sensor (AI)
(ix) (N) Condenser DP sensor (AI)
(x) (N) CHW Isolation Valve (BO)
(xi) (N) CDW Isolation Valve (BO)

(b) BACnet Integration Control / Monitoring Points:
(i) Fault/Alarm Status
(ii) Chiller Power
(iii) % Load
(iv) Others – TBD, Identified by Owner

(2) Chiller CH-2:
(a) Hardwired Points:
(i) (E) Chiller Enable / Disable (BO)
(ii) (N) Chiller Run Status (BI)
(iii) (N) Chiller Supply Temperature Set Point (AO)
(iv) (N) CHW Flowrate (AI)
(v) (E) CHW Leaving Sensor (AI)
(vi) (N) CHW Entering Sensor (AI)
(vii) (E) CDW Leaving Sensor (AI)
(viii) (E) CDW Entering Sensor (AI)
(ix) (N) Condenser DP sensor (AI)
(x) (N) CHW Isolation Valve (BO)
(xi) (N) CDW Isolation Valve (BO)

(b) BACnet Integration Control / Monitoring Points:
(i) Fault/Alarm Status
(ii) Chiller Power
(iii) % Load
(iv) Others – TBD, Identified by Owner

iii) Variable Volume CHW Pumps: Provide material, programming and integration from VFD to the existing EMCS for the following:
(1) Two [2] **new** primary CHW pump VFD(s) connections to the EMCS with the following points:
(a) Hardwired Points:
(i) (E) Pump CP-8 Start / Stop (BO)
(ii) (E) Pump CP-8 Status. Switch shall be suitable for VFD use and set based on low pump speed - TBD (BI)
(iii) (N) Pump CP-8 Speed Set Point (AO)

(b) BACnet Integration Control / Monitoring Points:
(i) Power
(ii) Fault
(iii) Communication Failure
(iv) Others – TBD, Identified by Owner

iv) Miscellaneous Control: In addition to the existing CHW System points that are to remain in place (e.g. CHW building return temperature, secondary CHWS & CHWR temperatures, etc.) provide material, programming and integration to the EMCS for the following new CHW System points:
(1) Provide One [1] CHW Decoupler Temperature Sensor (AI)
(2) Provide One [1] Secondary CHW Flow Meter (AI)
(3) Refrigerant Monitoring System: Provide one [1] trouble alarm (BI) and one [1] high level alarm (BI).

e) Heating Hot Water System: No new control points.

f) Condenser Water System: No new control points.

ECM Benefits

- Electrical energy savings.
- Added redundancy with multiple compressors in one chiller.
- Reduced Chiller Maintenance Costs.
- Reduced liability of Chiller in Parking Lot.

ECM 8 Underfloor Air Distribution Upgrades – New Government Center

Existing Conditions

New Government Center

Air conditioning for the New Government Center is provided by two types of air distribution systems, an Underfloor Air Distribution (UFAD) system and a traditional ducted system. A majority of the building is conditioned via the UFAD system while only the common areas and chamber areas of the first floor are supplied air via a ducted variable air volume (VAV) system.

Air Handling Units (AHUs) 2 and 3, located on the roof of the New Government Center provides conditioned air to all of the underfloor supply air plenums in the building. These AHUs are equipped with both chilled water (CHW) and heating hot water (HHW) coils to provide cooling and heating respectively. The CHW and HHW is supplied from the Government Center Complex Central Plant located near the Old Courthouse. Adjustable underfloor swirl diffusers are installed in the spaces so that air flow can be manually controlled by the occupants. Both AHU-02 and AHU-03 are equipped with variable frequency drives (VFDs) on both the supply and return fans to compensate for the fluctuations in pressure caused by the modulation of air flow to the zones. This is accomplished by continually adjusting the VAV box controls. In addition, HHW fan coil units (FCUs) are installed around the perimeter to provide reheat to the associated zones. The underfloor VAV boxes are difficult to access. The facility maintenance staff spends a significant amount of time and effort attempting to correct and address occupant comfort complaints by accessing these underfloor devices and making adjustments. This activity would be significantly alleviated through the implementation of a RCx program.

AHU-01 provides supply air to the common areas and the chamber areas located on the first floor. As mentioned, supply air is distributed to these zones by a ducted system. In addition VAV boxes with HHW reheats are installed in the spaces and are controlled by an adjustable temperature sensor. Similar to AHU-02 and AHU-03, AHU-01 is equipped with a CHW coil, a HHW Coil and VFDs on both the supply and return fans. All of the HVAC equipment at the New Government Center is tied to the Delta Energy Management and Control System (EMCS).

Although the HVAC system is relatively new as the building was constructed in the mid 2000's, it has been a problem for facility staff with frequent reports of air flow and occupant comfort issues.

The saving analysis was based on determining the existing estimated energy (kWh) attributed to the fan powered VAV boxes and the corresponding central plant component by using the energy allocation method. Then, a conservative savings factor of 25% was applied, based on past experience, to represent reduced run time for the AHU fans (50 HP supply fan motors and 20 HP return fan motors). In addition, a conservative savings factor of 5% was applied, based on past experience, to represent the reduced load on the chillers. The total existing HVAC electrical energy attributed to the fan powered VAV box systems were estimated at 487,000 kWh with the savings estimated at 45,456 kWh or approximately 10%.

ECM Description

New Government Center

The current system serves the perimeter with small fan powered boxes. The motors for these fans are not well suited for the conditions and are out of balance. In addition to these issues, there is no way to monitor the true air flows resulting in significant temperature control issues. Facility staff receive many perimeter temperature control complaints mostly during the cooling season.

The retrofit installs new motors for 65 of the VAV boxes. There are actually a total of 91 VAV boxes on AHU-02 and AHU-03, however, as these boxes have been failing, the facility staff have been upgrading to superior motors and installing EMCS delta control points for better monitoring.

The retrofit will additionally add control points to the Delta controls such that trends can be set up to record large AHU supply air temperature, delivery temperature, CFM airflows, and room space temperatures.

The system will be commissioned and air balanced to ensure proper operation. Significant energy savings will be achieved since the current operation typically operates the two large air handling units at or near 100% load in an effort to provide sufficient air to the perimeter zones. Once the new motors are installed with better controls, the variable frequency drives for the two large air handlers will be able to operate at lower VFD speeds on a regular basis.

Scope of Work

- Install new ½ HP Dayton model 3M714 fan motors to replace existing motor functioning within 65 of the 91 VAV boxes serving zones related to AHU-02 and AHU-03.
- Install 65 new controllers, one for for each box, to monitor actual box airflow and commission new controller / airflow reading.
- Add control points to the Delta controls so trends can be set up to record large AHU supply air temperature, delivery temperature, airflows and room space temperatures
- AHU-02 and AHU-03 systems shall be commissioned and air balanced to ensure proper operation.

ECM Benefits

- Reduction of both electrical and natural gas consumption.
- Reduce associated energy costs.
- Improve occupant comfort.
- Corrects wasteful operational strategies.
- Improves HVAC control strategies to correct deficiencies.
- Recalibrates wasteful temperature control equipment to improve efficiency.

ECM 19 Kitchen Hood Controls - Honor Farm

Existing Conditions

The kitchen at the Sherriff's Honor Farm is equipped with two (2) exhaust fume hoods and each fume hood system has two exhaust fans along with linked makeup air units. The larger of the two systems is equipped with a 3 and 5 HP exhaust fan and an interlocked makeup air unit for each fan that matches the exhaust fan air volume. The larger hood system serves the kettles and is in the center of the kitchen.

The smaller hood system is installed along an outside wall and has two smaller exhaust fans which are 0.5 and 1HP, respectively. Those fans are also tied to makeup air units that supply the same volume of air that each exhaust fan removes and operate simultaneously.

The kitchen fume hood systems are operated manually and provide 100% flow rate and speed continuously. This results in excessive energy consumption during periods of relative cooling inactivity. Kitchen staff provided current operating hours for the hood fan systems which are operated manually. The large hood system serving the kettles in the middle of the kitchen have heavier usage and the fans are operated 15 hours/day seven days/week. The smaller hood system against the outside wall is operated 12 hours/day seven days/week. Operating hours were determined by discussion with kitchen staff.

ECM Description

This ECM includes the installation of an intelligent hood control system to be installed on both the large kitchen hood system serving kettles and the smaller kitchen hood system located along the outside wall. The fans for hood exhaust and make-up air are currently in good operating condition. These systems will reduce electrical energy consumption. The concept of the Melink control system is to reduce flow during low use time periods.

This is accomplished by installing a variable frequency drive on the hood exhaust fan and makeup air unit. Temperature sensors are used to detect heat from appliances and optic sensors are used to detect effluent (smoke and vapor). As heat or effluent increases, signals are sent to a master controller which in turn increases the speed of the VFD on the exhaust and makeup air fans. Once the heat or effluent dissipates due to non-use, the VFD is ramped down which results in significant electrical energy savings throughout the day.

Image 4-6

A site visit was performed in April of 2015 and existing equipment data was collected. A detailed preliminary design has now been completed, and it is recommended that a Melink system be installed on the fume hoods in the Sherriff's Honor Farm kitchen.

The savings are based MElink's Intelihood simulation energy savings software based on operation feedback from the kitchen staff. The fan power was calculated by using the nameplate horsepower for the exhaust fans and make-up air units, which totaled approximately 18 HP then converting to kW by assuming a load factor of 85% and a motor efficiency of 80%, or 14.4 kW. The annual energy consumption (kWh) was determined by applying the estimated run hours of 6,000 hours per year for the larger motors (2-5 HP, 2-3HP) and 5,000 hours per year for the smaller motors (1-1.5 HP, 1-0.5 HP). By applying the VFDs and controls to the hoods, it is estimated that there will be 54% savings, due to the predicted load profile of the motor speed to runtime, as shown below.

Motor Speed	% Run Time
100%	30%
90%	5%
80%	5%
70%	15%
60%	10%
50%	10%
40%	5%
30%	20%
20%	0%
10%	0%

Scope of Work

The PG&E SST team and subcontractor Melink propose to furnish and install the Intelli-Hood system to interface with the existing kitchen exhaust hood systems for two (2) hoods. One (1) serving the large kitchen hood system serving kettles and a second one (1) serving the smaller kitchen hood system located along the outside wall at the Sherriff's honor Farm.

The proposed work is based on information provided by the Customer or obtained through a site survey performed by a Melink authorized technician.

List of Components and Material:

System Controller Assy, IH3, Standard	1
Assembly, Touchpad, IH3	1
User Interface Mounting Kit, Surface	1
Sensor Assy, IH3, Hood Controller	6
Sensor Assy, IH3, Optic Set, 28"	6
Sensor Assy, IH3, Temp Sensor Quick Seal	9
Cable, IH3, 8 Conductor with ends, 200 ft	1
Cable, IH3, 8 Conductor with ends, 100 ft	2
Cable, IH3, 8 Conductor with ends, 50 ft	4
Cable, IH3, 8 Conductor with ends, 30 ft	5
Cable, IH3, 8 Conductor with ends, 15 ft	15
Cable, IH3, 8 Conductor with ends, 5 ft	8
Cable, IH2, Coupler	1

Cable, IH3, 10 shielded RJ45 hardware pack	1
Exh Fan VFD Finished, IH3,ABB, Bypass, Nema3R, 460V, 2HP	2
Exh Fan VFD Finished, IH3,ABB, Bypass, Nema3R, 460V, 5HP	2
MUA VFD Finished, IH3,ABB, Bypass, Nema3R, 460V, 3HP	3
Relay, RIB, 120VAC/24VDC, 10A, Multitap, Functional Devices, Inc. RIB (Relay In Box) - SPDT 10A, 120VAC/10-30VDC, Multitap Voltage Coil	2

Additional Melink Services Provided:

INTELLI-HOOD PRE-INSTALL SITE COORD.

IH INSTALL - Perform installation of demand ventilation controls for kitchen

Includes installation of the Intelli-Hood components. Intelli-Hood component work shall be completed by Melink Corporation authorized personnel.

Work associated with installation of each of two (2) systems shall include but is not necessarily limited to:

1. Install temperature sensor(s) in hood
2. Install optic sensors and air purge units
3. Install hood control units
4. Install low voltage cables between the sensors and the processor(s) .

INTELLI-HOOD START-UP - Perform startup of demand ventilation controls for kitchen.

Startup will be completed by a Melink Corporation authorized technician to complete the final connections, final programming, commissioning and Customer training. Customer training is included at the time of startup with the owner / owner's representative / contractor available onsite. If a separate visit is requested for training a separate Purchase Order or contract amendment will be necessary for the specified training duration.

<u>Electrical Work shall include the following:</u>

1. Mount and power Intelli-Hood I/O Processor(s). Note: Processors must lose power when the fire suppression system is activated

2. Install Keypad(s).
3. Install VFDs.
4. Install CAT5 communication cables from the Intelli-Hood Processors to the VFDs.
5. Furnish and install all necessary non-Melink furnished control wire for system integration.
6. Furnish and install all necessary conduit
7. Provide all necessary building penetrations

Obtain electrical permit, if required

ECM Benefits

- Intelli-Hood system optimizes energy use and eliminates significant unnecessary air flow.
- Helps to reduce the County's facility carbon footprint.

Extended exhaust fan life through reduced operating hours and loading.

ECM 20 Personal Computer Energy Management System - Various

Existing Conditions

Personal computers (PCs) have been documented to consume an estimated 7-10% of the electricity usage throughout a typical municipal facility. This energy usage can be examined for user behavior and practices which cause energy waste, and new energy use strategies can be implemented.

Several software products are available on the market today to accomplish these energy savings strategies. One such product is the System Center Configuration Manager (SCCM), from Microsoft. The County has already purchased 2,045 licenses for this software, and has already begun deploying the software on some machines, although the power management feature has yet to be enabled on any machines at this time.

ECM Description

It is recommended that a personal computer energy management system, namely the power management feature of the Microsoft SCCM software, be installed throughout various county departments.

Findings demonstrate that these types of PC energy management tools can cut energy use by approximately 50%. These findings have been reviewed and accepted by PG&E, SCE and SDG&E.

Once installed, savings in terms of electrical consumption will be realized – overnight - with minimal setup and maintenance. At the same time, these types of PC energy management tools detail PC related energy use and cost savings, with built-in reporting. For this ECM, demand savings are excluded since the majority of energy savings occur during off-peak hours.

The initial field data findings are based on a launch of Verdiem's Surveyor software on 91 county PCs, and the resulting baseline and energy savings estimates are based on the downloaded data from the Surveyor program. Although Surveyor ultimately won't be deployed on any County machines now that Microsoft SCCM is the preferred software, the baseline energy use information received from the test launch of Surveyor software is still valid.

The total quantity of Microsoft SCCM licenses currently owned by the County is 2,045 based on information received from the County IT department, and is broken down by department as follows:

- Assessor - 80 (included in the Core CAL Suite)
- IT - 450 (includes General Services, Parks, Airports)
- Health Agency - 500
- Human Resources - 28
- Planning - 110
- Probation - 212
- Public Works - 165
- Social Services - 500

Based on the reviews with the County, it is recommended that this ECM be applied only to the General Services and Planning machines first, as a test. Once favorable results are achieved in these two departments, hopefully other departments will also follow suit and another round of installations can be completed.

Therefore, the ECM savings estimates and project implementation costs in this IGA Report are based on software implementation on 212 machines in the Planning Department, and 160 machines in the Department of General Services.

Baseline Energy Consumption

Surveyor software was installed on 91 computers owned by the County. Surveyor reports operating events that relate to energy consumption and their durations. From these actions, energy use is calculated. Based on the Surveyor monitoring, the energy consumption for these 91 machines averaged 100 kWh per day on weekdays and 60 kWh per day on weekends. For the 372 computers considered the baseline annual energy use can be extrapolated to 139,500 kWh (375 kWh per computer) per year.

Saving Potential

Additional information gathered from the Surveyor baseline study showed that the machines are, on average, on about 70% of the time during the week and about 62% of the time on weekends. The displays are on about 22% of the time during the week and almost not at all during weekends.

Based on data gathered for the month of April, a conservative estimate of 200 kWh per computer per year is a reasonable amount of savings (or 200 kWh/375 kWh, or approximately 53% savings). This is based on assuming the weekday usage has approximately a 20% drop with the weekend usage seeing a 40% drop.

Scope of Work

1. Provide pre-installation CPU baseline electrical use data and/or reports as necessary to support PG&E incentive application requirements.
2. Work with County IT staff to support the installation of Microsoft System Center Configuration Manager (SCCM) software on the County's network to provide energy management opportunities on 212 CPUs for the Planning Department and 160 CPUs for the Department of General Services, utilizing existing licenses already purchased by the County. For machines with SCCM already installed, the power management feature will be enabled.
3. Provide post-installation CPU baseline electrical use data and/or reports as necessary to support PG&E incentive application requirements.
4. Scope of work, costs, and savings can be expanded proportionally to deploy Microsoft SCCM to additional CPUs if other County Departments choose to do so.

ECM Benefits

- Safely shuts down machines after work hours, or after network maintenance.
- Introduces new flexibility to PC power schemes, making them more user-friendly and energy efficient.
- Makes PC power options accessible and easy to control, without interrupting PC users or network activities.
- Offers flexibility benefits to the IT department.

ECM 21A Expand EMCS to Remote Facilities

Existing Conditions

The County maintains facilities beyond Templeton in the north part of the county to beyond Arroyo Grande in the south. These facilities provide San Luis County residents access to a variety of services such as health clinics, pregnancy services, police and libraries.

While these facilities and services are critical to County operations they present a challenge geographically to those responsible for their operation as any complaint must be diagnosed and resolved locally which can mean an additional 1-2 hrs of travel time per incident. Additionally, many of the rooms and offices in these facilities are not used continuously and represent an opportunity for energy savings by resetting room temperature set points when there is no one in the space. While the O&M savings are considerable for this measure, the energy savings are the real driver for recommending this measure.

The County has invested in an energy management and control system (EMCS) from Delta Controls in many of its key facilities such as the downtown Government Center and Health Center. Terminals for this system are located at multiple County facilities providing for convenient access to the status of any building or equipment on the system.

ECM Description

This measure would install a new Delta Controls building controller at each facility identified in the table below and replace existing thermostats with new thermostats with integrated occupancy sensors capable of integrating with the Delta controls panel.

Each thermostat will communicate with the main building controller on a dedicated network connection and will provide for local occupancy override if the space is used outside of scheduled operating hours.

A site visit was performed in February of 2015 during which each facility was visited and existing HVAC equipment and thermostat data was collected. A detailed preliminary design has now been completed.

The list of buildings to receive new controls below was developed and prioritized by County Facilities staff. Energy savings were determined examining actual baseline utility usage and building operating hours, and comparing that to the new scheduling and setback capabilities of the new controls system.

Table 4-7: County of SLO – Buildings to Receive New EMCS

Building	Priority Code	Equipment
North County		
Public Health (Paso Robles)	A1	4 – HVAC Packaged Systems
Ag Commissioner (Templeton)	A2	3 – HVAC Packaged Systems
Sheriff (Templeton)	A3	4 – HVAC Split Systems
Drug and Alcohol Services (Atascadero)	A4	4 – HVAC Split Systems
Atascadero Hospital Site, Public Health, Mental Health	A5	6 – HVAC Split Systems 2 – Roof HVAC Systems
South County		
Nipomo Library	B1	4 – HVAC Packaged Systems
Ag Commissioner (Arroyo Grande)	B2	4 – HVAC Packaged Systems
Health Center (Grover Beach)	B3	1 – HVAC Split System
Drug & Alcohol Services (Grover Beach)	B4	4 – HVAC Split Systems
Operations Center		
Detectives Building	C2	5 – HVAC Split Systems
Main Female Jail	C3	11 – HVAC Systems 1 – DX Clg Fan Coil
Juvenile Hall	C4	4 – HVAC Split Systems 1 – HVAC System 1 – DX Cooling Only Fan Coil 3 – Reznor Heaters
Animal Services	C5	1 – HVAC System
General Services Downtown	C6	5 – HVAC Systems
Kimball Building	C7	6 – HVAC Systems
Grand Jury	C8	1 – HVAC Split System
Ag Commissioner / Health Agency	C9	12 – HVAC Roof Packaged Systems
Sheriff Sub Station (Los Osos)	D2	1 – HVAC Roof Packaged System
Arroyo Grande Library	D3	6 – HVAC Roof Packaged Systems

The saving analysis was based on determining the existing estimated energy (kWh and therms) attributed to the HVAC systems by using the energy allocation method. Then, a conservative savings factor of 20%-25% was applied, based on past experience, to represent set point changes, and reduced run times. The HVAC energy savings was estimated at 162,000 kWh and 11,000 therms.

Scope of Work

The PG&E SST team and subcontractor ESI propose to furnish and install the new Delta Controls by completing the following scope of work:

- Provide and install new Delta Controls building control panel in a location to be coordinated with the County.
- Coordinate with County IT staff on installation of Ethernet run from new building control panel to county owned Ethernet switch or hub. (County IT staff to identify port # for termination of Ethernet cable and assigned IP address for building control panel. One IP address is required per building.)
- Install new 120V circuit for building control panel.
- Provide wireless nework to new thermostat for each HVAC system as identified in Table 4-7.
- Programming as required to configure schedules, unoccupied temperature settings, override setting.
- EMCS graphic representation of building with floor plan layout of areas served and key EMCS point data.
- Training for Facilities Maintenance staff after installation.

The proposed work is based on information provided by the Customer or obtained through a site survey performed.

ECM Benefits

- Energy savings resulting from reset of space temperatures during unoccupied periods.
- Increased maintenance staff effectiveness through remote diagnosis and troubleshooting of temperature complaints.
- Increased County employee satisfaction by improved County maintenance staff responsiveness to building conditions.
- Reduction of County's facility carbon footprint.

- Extended HVAC system life through reduced operating hours and loading.

ECMs Evaluated But Not Recommended

Due to County budget constraints, not every ECM that was investigated could be recommended for implementation. ECMs that had the highest simple payback, did not qualify for certain funding sources, or were particularly difficult to implement became candidates for rejection. After numerous conversations with the County and various iterations of the recommended project list, the following ECMs ultimately were not recommended for implementation.

ECM 5 Packaged Unit Replacement - Juvenile Hall / Health Lab

Existing Conditions

Health Lab:

Heating Ventilation and Air Conditioning for the lab areas is provided by three (3) packaged rooftop units (RTUs). These packaged air conditioning units each consist of a self-contained compressor, condenser, evaporator, furnace and supply fan. The units are controlled by manual thermostats installed in the labs and are not tied into the County's Delta EMCS. Two (2) of the units are approximately 10 years old while the third unit is 13 years old. The units are rated to provide a total of 16 tons of cooling and 240 MBH of heat. All of the units installed at the Health Lab operate using R-22 Refrigerant. This refrigerant is in the process of being phased out. By 2020, chemical manufacturers will no longer be able to produce R-22 refrigerant used to service existing chillers, packaged air conditioning units and heat pumps, thus making it difficult and costly to obtain and maintain equipment that operates with R-22. In addition, R-22 has a high Global Warming Potential (GWP) and contributes to global temperature rise.

Figure 4-4: The existing RTUs at the Health Lab operate using R-22 Refrigerant which is currently in the process of being phased out.

Juvenile Hall:

The existing 7.5 ton roof mounted condenser/compressor unit for Booking, the 3 ton roof mounted condenser/compressor unit for the Central Area, and the 5 ton ground mounted condenser/compressor for the Administration Lobby are all at the end of their useful life, inefficient, and in need of replacement.

The Trane unit for the Booking area is served by a rooftop water chiller and a rooftop boiler. The boiler and chiller have had continual maintenance issues and have been a problem for the facility maintenance staff on a regular basis. The rooftop air handling unit is in good condition and is not recommended for replacement. There are available small boilers and air cooled water chillers that are much more efficient, which could reduce cooling energy at the Juvenile Hall.

ECM Description

Health Lab:

The Packaged RTUs will be replaced on a like-for-like basis with new high-efficiency equivalents, promoting both electrical and natural gas savings. Unit sizing was verified based on a square foot per ton basis. In addition, the new units will operate using R-410a Refrigerant. R-410a is readily available unlike R-22 which is currently in the process of being phased out; as a result operation and maintenance costs will be reduced. R-410a is also environmentally friendly and does not contribute to the depletion of the ozone. Special attention will be given to the control system associated with the main laboratory unit. Controls programming will be implemented utilizing the exiting controls system to ensure that the prescribed laboratory outside air change requirements are continually met for this system.

Juvenile Hall:

It is recommended that three (3) packaged split condenser/compressor units and their associated air handling unit cooling coils be replaced with high efficiency units serving Booking, Central Area and Admin Lobby. Unit sizing was verified based on a square foot per ton basis. Also, it is recommended that the existing air cooled chiller and hot water boiler serving an additional 4th Trane large rooftop air handling unit equipped with hot water and chilled water coils be replaced. Replacing the boiler and chiller, and rooftop air handling unit with a self-contained packaged rooftop unit was considered but not recommended for two reasons. The first being the high cost associated with retrofitting a new roof curb, and the second being the fact that upon further investigation, the existing

Trane rooftop unit was found to be of high quality, durable construction, and in good condition.

A verification of existing installed tonnage was performed using County provided Juvenile Hall as built drawings along with field gathered nameplate data for the equipment and the following table describes the results;

JUVENILE HALL- SQFT/Ton Verification:

SPACE	L (ft)	W (ft)	Area (sqft)	Tons	SqFt/Ton
Admin	43	47	2021	5	404
Booking Area	52	60	3120	8	390
Central Area	63	48	3024	7.5	403

Considering the space utilization and type for these areas, the above square foot per ton figures support the fact that the existing size of the cooling equipment is acceptable. Taking into consideration the figures in the above table along with the fact that there were no lack of cooling issues communicated during the walkthrough and site interviews, it is recommended that a like for like replacement is appropriate.

Health Lab - Scope of Work

Demo and Removal:

(Special Note: Removed/demolished equipment, components and systems. However, equipment in fair to good condition should be sold by Purchasing (Surplus), not destroyed. All equipment that will no longer be used should be sold by Purchasing (Surplus). Equipment deemed to be in fair to good condition must be returned to the County)

- Remove three (3) rooftop units and dispose of according to all local, state and federal laws including evaporator heads, condensing unit and line sets including the proper recovery of the refrigerant and proper disposal of the old system.
- Recover and dispose of refrigerant charge per the EPA Guidelines.

New Equipment Installations:

Location	Quantity	Tonnage
Health Lab	3	3.5, 5, 7.5

Electrical/Wiring

- Shut down unit and lock out electrical power supply

- Connect electrical to existing unit disconnect
- Install new electrical and conduit from junction box to unit disconnect and terminal board where new unit footprint requires this
- Reconnect existing electrical and control wiring
- Install all necessary breakers/fuses, relays, disconnection devices and wiring to match existing voltage and power service to three (3) new rooftop units.

HVAC Labor

- Provide and install three (3) new packaged rooftop units
- Patch and repair roofing around roof curb to match existing
- Install new condensate drain lines as needed
- Waterproof any new penetrations
- Patch, paint or repair any damage or stains as result of the work performed to match existing
- Integrate existing controls to function with the new rooftop units or provide new controls.

Controls:

- Revise the existing Delta controls to the following equipment:
- Three (3) Rooftop package units
- Add Supply air and Fan status sensors to the new units

Juvenile Hall - Scope of Work

Demo and Removal:

(Special Note: Removed/demolished equipment, components and systems. However, equipment in fair to good condition should be sold by Purchasing (Surplus), not destroyed. All equipment that will no longer be used should be sold by Purchasing (Surplus). Equipment deemed to be in fair to good condition must be returned to the County)

- Remove two (2) existing roof mounted split compressor/condenser units and two (2) attic space indoor air handling unit cooling coils and recycle/dispose of all material according to all local, state and federal laws.
- Remove one (1) existing rooftop water chiller and one (1) existing rooftop boiler and their associated equipment and

recycle/dispose of all material according to all local, state and federal laws.

- Remove one (1) existing ground mounted split compressor/condenser unit and one (1) attic space indoor air handling unit cooling coil and recycle/dispose of all material according to all local, state and federal laws.

New Equipment Installations:

Location	Quantity	Type	Tonnage
Booking	1	Roof mounted split	7.5
Booking Area	1	Roof mounted chiller	5
Booking Area	1	Roof mounted boiler	136 MBH
Central Area	1	Roof mounted split	3
Admin Lobby	1	Ground mounted split	5

Electrical/Wiring:

Where possible, reuse existing breakers/fuses, relays, disconnection devices and wiring to match existing voltage and power service to three (3) new mechanical condenser/compressor units and one (1) each air cooled water chiller and hot water boiler. Replace if required.

HVAC Labor:

1. Provide all necessary tools, equipment and labor to install two (2) split roof mounted compressor/condenser units (3 ton and 7.5 ton) and accompanying air handling unit cooling coil, one (1) 5 ton ground mounted compressor/condenser unit and accompanying air handling unit cooling coil, and one (1) each 5 ton air cooled water chiller and 136 MBH input hot water boiler in accordance with all county and State codes and laws.
2. Recover and dispose of refrigerant charge per the EPA Guidelines.
3. Complete proper preparation work for installation. Including but not limited to, cordoning off work area and turning off all live electrical circuits servicing existing wall mounted units.
4. Waterproof any new penetrations.
5. Patch, paint or repair any damage or stains as result of the work performed to match existing.

6. Start, test and check for proper operation immediately following installation.

Controls:

Add Delta controls to the following equipment:

A. 1- 5 ton Rooftop unit (Booking Area)

B. 1- 7.5 Ton split system (Booking)

C. 1- 3 Ton split system (Central)

D. 1- 5 Ton Split system (Admin Lobby)

- Revise the Existing Delta system to accommodate new chiller and boiler
- Remove replace all room sensors/thermostats with BACstat sensors with display and adjustments
- Add Supply air and Fan status sensors to the new units

ECM Benefits

- Reduce both electrical and natural gas consumption
- Reduce operating and maintenance costs
- Improve staff comfort levels
- Remove equipment that operates with R-22
- Improve System Reliability

ECM 9 Pneumatic-DDC Tstats – Library

Existing Conditions

Cooling and heating for the library is provided by (30) fan coil units serving various spaces. The heating and cooling water is provided by the Government Center Complex Central Plant. The fan coil units are turned off and on by a seven day mechanical time clock. The heating and cooling valves on the fan coils are controlled by local stand alone pneumatic thermostats. The energy used by the fan coil units can be reduced by integrating their local control to the Delta Energy Management and Control System (EMCS). This would provide remote access to adjust schedules and setpoints based on operational needs. Advanced control programs could also be introduced to reduce energy even further.

Based on the time clock settings, the fan coil units operated as follows:

Monday	7:00 AM to Tuesday at 4:00 AM
Tuesday	7:00 AM to 9:30 PM
Wednesday	7:00 AM to 5:00 PM
Thursday	7:00 AM to 7:00 PM
Friday	7:00 AM to 6:00 PM
Saturday	7:00 AM to 5:00 PM
Sunday	OFF

ECM Description

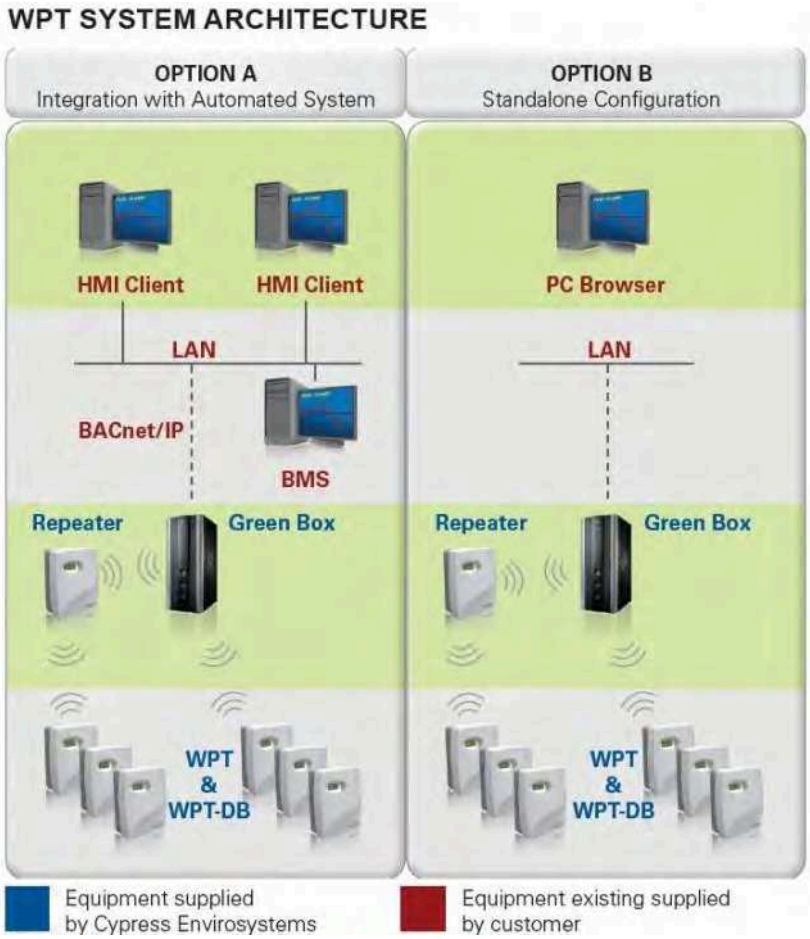
Replace the 30 fan coil unit thermostats with Cypress Wireless Pneumatic Thermostats, which are capable of communicating with the County's Energy Management system. This will allow for tighter scheduling, reset of temperature setpoints based on conditions and remote troubleshooting of these systems.

Scope of Work

- Install (30) Cypress Complete Deadband Wireless Pneumatic Thermostat Systems at the Library. Includes: installation labor, commissioning, Green Box Controller(s), wireless pneumatic thermostats, and wireless repeaters.
- Programming (40 hours) to add new library thermostats and scheduling to the existing Delta EMCS system.
- County intranet to be provided by the owner.

Features of the new Cypress system include:

- Simple retrofit of existing pneumatic thermostats
- Programmable deadband that dynamically changes during night setbacks for increased energy efficiency
- Delivers DDC-like functionality
- Remote monitoring of temperature
- Remote monitoring of branch pressure
- Remote control of setpoint and deadband span
- Automatic self-calibration
- Occupancy override notification
- Programmable temperature setbacks
- No computer needed for programming of standalone thermostats
- Easy to install wireless system
- Optional BACnet/IP interface to integrate with the existing Delta Building Automation System



ECM Benefits

- Digital zone control optimizes energy usage and comfort
- Night setbacks can dynamically adjust the deadband
- Programmable temperature setbacks saves energy
- Implement indoor temperature policies for added energy savings
- Enables use for utility Demand Response programs
- Occupancy override logs tenant after-hour usage
- Built-in diagnostics lowers maintenance cost

ECM 13 High Efficiency Transformers

Existing Conditions

The majority of low voltage dry-type transformer manufacturers optimize their products in the context of lowest first cost because this is how the product is typically selected. Given the disconnect in the selection process between performance/price and the requirements of the various stake holders including the design engineer, the installing contractor and the end user, little if any attention is paid to optimize the product for the specific electrical system or to remedially address outstanding issues.

With the advent of new efficiency requirements and standards such as EPAct legislation effective 2007 (NEMA TP1), NEMA Premium, and the US Dept. of Energy's low lifecycle efficiency classes, transformer manufacturers have upgraded their transformer technologies to meet these new efficiency requirements.

The advent of these more efficient low voltage dry-type transformers provides the County an opportunity to replace older less efficient transformers with new high efficiency transformers. The net impact is to reduce energy use while increasing reliability.

ECM Description

Replace existing low voltage transformers with new high efficiency transformers in the following buildings:

- New Government Center
- Old Government Center
- Department of Social Services
- Main Jail
- Honor Farm

The following table provides an inventory of the transformers that will be replaced as part of this ECM:

Transformer Count	Building Name	Location ID or Room #	Transformer Designation	Existing kVA	Replacement kVA	Baseline Efficiency (Normal Operation)	Baseline Efficiency (Outside Op. hrs)	Powersmiths Efficiency (Normal Operation)	Powersmiths Efficiency (Outside Op. hrs)
1	New Government Bldg	Rm. 109	1TN2	75	75	93.1%	90.4%	98.5%	98.1%
2	New Government Bldg	Rm. 109	1TE	45	45	91.2%	87.8%	98.2%	97.8%
3	New Government Bldg	Rm. 103	KTN1	30	30	90.7%	86.9%	98.1%	97.6%
4	New Government Bldg	P112	TN1	75	75	93.1%	90.4%	98.5%	98.1%
5	New Government Bldg	209	2TN2	75	75	93.1%	90.4%	98.5%	98.1%
6	New Government Bldg	209	2TE	30	30	90.7%	86.9%	98.1%	97.6%
7	New Government Bldg	212	2TN1	45	45	91.2%	87.8%	98.2%	97.8%
8	New Government Bldg	312	3TN1	75	75	93.1%	90.4%	98.5%	98.1%
9	New Government Bldg	309	3TN2	75	75	93.1%	90.4%	98.5%	98.1%
10	New Government Bldg	309	3TE	30	30	90.7%	86.9%	98.1%	97.6%
11	New Government Bldg	412	4TN1	45	45	91.2%	87.8%	98.2%	97.8%
12	New Government Bldg	409	4TN2	45	45	91.2%	87.8%	98.2%	97.8%
13	New Government Bldg	409	4TE	30	30	90.7%	86.9%	98.1%	97.6%
14	Old Government Ctr	232	Jeffries	45	45	91.2%	87.8%	98.2%	97.8%
15	Old Government Ctr	232	Jeffries	150	150	94.6%	92.4%	98.7%	98.4%
16	Old Government Ctr	383	Jeffries	150	150	94.6%	92.4%	98.7%	98.4%
17	Old Government Ctr	4th floor	Jeffries	150	150	94.6%	92.4%	98.7%	98.4%
18	Old Government Ctr	155	Westinghouse	112.5	112.5	94.3%	92.0%	98.6%	98.2%
19	Old Government Ctr	Outside - alley	TA	500	500	95.4%	93.4%	99.0%	98.6%
20	Old Government Ctr	Outside - alley	Westinghouse	150	150	94.6%	92.4%	98.7%	98.4%
21	Old Government Ctr	Outside - alley - below hallway	Square D	45	45	91.2%	87.8%	98.2%	97.8%
22	Old Government Ctr	Roof, next to cooling towers	Square D	75	75	93.1%	90.4%	98.5%	98.1%
23	Old Government Ctr	108	Elevator Eq	30	30	90.7%	86.9%	98.1%	97.6%
24	Dept of Social Services	112	Square D	75	75	93.1%	90.4%	98.5%	98.1%
25	Dept of Social Services	211	Square D	75	75	93.1%	90.4%	98.5%	98.1%
26	Dept of Social Services	314	Square D	75	75	93.1%	90.4%	98.5%	98.1%
27	Main West Jail	Main Elec. Rm.	TX-2	150	150	94.6%	92.4%	98.7%	98.4%
28	Main West Jail	Central Control - Pit	ETX-2	45	45	91.2%	87.8%	98.2%	97.8%
29	Main West Jail	West Housing Control	ETX-3	30	30	90.7%	86.9%	98.1%	97.6%
30	Main West Jail	West Dorm Control	ETX-1	30	30	90.7%	86.9%	98.1%	97.6%
31	Main West Jail	Outside by transfer switch		112.5	112.5	94.3%	92.0%	98.6%	98.2%
32	Honor Farm	Main Elec. Rm.	DPA1	30	30	90.7%	86.9%	98.1%	97.6%
33	Honor Farm	Main Elec. Rm.	DPAE	30	30	90.7%	86.9%	98.1%	97.6%
34	Honor Farm	Main Elec. Rm.	DPKE	45	45	91.2%	87.8%	98.2%	97.8%

The old transformers listed above will be replaced with new technology transformers that have significantly less losses, resulting in energy savings. The new transformers will be individually designed to replace old transformers, with matching impedance and form factor. As a result,

revised arc flash protection studies for the electrical systems affected will not be needed.

Existing transformers will be removed and disposed of per federal and state environmental regulations. Existing non-code conforming conditions/installations will be identified and County will be notified prior to start of construction.

Scope of Work

- Provide and install 34 new low voltage (120/208V) distribution transformers, per the table above.
- Shut down power to existing low voltage transformer at nearest high voltage distribution panel.
- Disconnect high and low voltage connections.
- Remove and replace existing transformer with new high efficiency transformer with equivalent impedance to the transformer to be removed.
- Reuse existing conductors, lugs and conduit where possible.
- Pre- and post-installation electric use measurement to verify savings

ECM Benefits

This ECM will:

- Reduce the building's annual electric energy consumption and demand.
- Improve the condition, efficiency, reliability the building's electrical systems.

ECM 11 Install H&V Unit VFDs - Main Jail

Existing Conditions

Heating and ventilating units HV-1 through HV-8 exclusively serve cell areas and their adjacent common area. These H&V units consist of a gas fired furnace section and a supply fan. Each area also has a 0.5 HP general exhaust fans, EF-1 through EF-8. The H&V units and exhaust fans are controlled such that they operate simultaneously. These units and their linked exhaust fans are required to operate continuously. Each HV unit is equipped with a 7.5 HP supply fan and a 3 HP return fan. The units provide 100% outside air.

During 2014, HV-5 was retrofitted with a 7.5 HP variable frequency drive (VFD). The return fan does not have a VFD and is still constant volume. This project was installed as a "test case" and the VFD is simply being controlled by setting the fan to a prescribed reduced speed and that speed is constant and does not changed based on any parameter. Although the H&V units are not efficient, there are no other operational issues observed or reported at this time.

ECM Description

VFDs would be installed to control the heating and ventilating unit's supply and return fans. Because the units serve inmate living areas, the air handling units are required to operate continuously. The VFDs will slow the fans down to 50% of the design airflow during a 7-hour night setback period between the hours of 10:00 PM and 5:00 AM daily. The setback airflow will still meet ventilation requirements.

These scheduling speed changes will be programmed into, and commanded from, the VFDs themselves. In addition to the above mentioned time of day schedules, there is an overriding control algorithm which ramps the fan speed from 50% up to 100% as the outside air temperature increases from 80°F to 90°F. Above 90°F, fan speed is a constant 100%.

When the AHU's mode changes from Daytime to Nighttime, the VFD control program shall set the fan speed to NIGHT mode and operate at 50% (adjustable) speed. When the AHU's mode changes from Nighttime to Daytime, the VFD control program shall set the fan speed to DAY mode and operate at 75% (adjustable).

The control program of the VFD shall continually monitor outside air temperature, and will ramp speed from 50% up to 100% as the outside air temperature increases above 80°F.

It is also recommended that the aging general exhaust fans, which are a continual maintenance problem for the facility staff, be replaced with new constant speed exhaust fans. Control for the exhaust fans will remain unchanged and the fans will be linked via the Delta Controls system to their corresponding HV unit and will operate simultaneously with that unit.

Scope of Work

Demo and Removal:

(Special Note: Removed/demolished equipment, components and systems. However, equipment in fair to good condition should be sold by Purchasing (Surplus), not destroyed. All equipment that will no longer be used should be sold by Purchasing (Surplus). Equipment deemed to be in fair to good condition must be returned to the County)

- Remove eight (8) existing rooftop exhaust fans and recycle/dispose of all material according to all local, state and federal laws.
- Remove existing exhaust duct sleeves and any necessary plenum and recycle/dispose of all material according to all local, state and federal laws.

New Equipment Installations:

Location	Quantity	HP
EF1-8	8	0.5
VFDs on HV1-4, HV6-8 supply fans	7	7.5
VFDs on HV1-4, HV6-8 return fans	7	3

Electrical/Wiring:

Where possible, reuse existing breakers/fuses, relays, disconnection devices and wiring to match existing voltage and power service to eight (8) new exhaust fans and fourteen (14) new variable frequency drives (VFDs). Replace if required.

HVAC Labor:

1. Provide all necessary tools, equipment and labor to install eight (8) 0.5 HP exhaust fans and install fourteen (14) VFDs in accordance with all county and State codes and laws.

2. Complete proper preparation work for installation. Including but not limited to, cordoning off work area and turning off all live electrical circuits servicing existing fans and HV units.
3. Waterproof any new penetrations.
4. Patch, paint or repair any damage or stains as result of the work performed to match existing.
5. Start, test and check for proper operation immediately following installation.
6. Integrate existing controls to function with the new exhaust fans and VFDs or provide new controls.

Controls:

Revise the existing Delta controls to the following equipment:

A. 7- HV units

B. 8- Exhaust Fans

Programming will reflect above mentioned sequence of operation, all VFD's to come standard with a BACnet interface

ECM Benefits

- This ECM will reduce energy use while maintaining occupant comfort.
- Significant electrical energy savings.
- Reduced AHU fan wear resulting in O&M savings.

ECM 14 H&V Unit Replacement - Honor Farm

Existing Conditions

The existing heating and ventilating units for both the men's and women's dormitory buildings are at the end of their useful life, inefficient, and in need of replacement.

The four units are hot air furnaces and are supplied natural gas. There are available units that are much more efficient, which could reduce heating energy at these dormitory buildings.

ECM Description

The units will be replaced with packaged interior high efficiency natural gas fired hot air furnaces. The existing flue routing may be reused depending upon the new system design, but any required flue modifications will be included in the installation. Currently the replacement units are sized identical to the existing units. If this measure becomes recommended in the future, a more detailed analysis will be done.

Scope of Work

Demo and Removal:

(Special Note: Removed/demolished equipment, components and systems. However, equipment in fair to good condition should be sold by Purchasing (Surplus), not destroyed. All equipment that will no longer be used should be sold by Purchasing (Surplus). Equipment deemed to be in fair to good condition must be returned to the County)

- Remove four (4) existing vertical natural gas fired hot air furnaces and dispose of according to all local, state and federal laws including existing gas train accessories and flues and proper disposal of the old system.

New Equipment Installations:

Location	Quantity	MBH
Men's Dorm	2	60
Women's Dorm	1	115
Women's Dorm	1	154

Electrical/Wiring

- Shut down all units and lock out electrical power supply

- Connect electrical to existing unit's disconnect
- Install new electrical and conduit from junction box to unit disconnect and terminal board where new unit footprint requires this
- Reconnect existing electrical and control wiring
- Install all necessary breakers/fuses, relays, disconnection devices and wiring to match existing voltage and power service to four (4) new forced air H&V units

HVAC Labor

- Provide and install four (4) new natural gas forced air H&V units
- Waterproof any new penetrations
- Patch, paint or repair any damage or stains as result of the work performed to match existing

Controls:

Add Delta controls to the following equipment:

A. 2- Split system units for the Men's dorm

B. 2- Split system units for the Women's dorm

- Add 1 Delta RTR to the Sheriff Honor building to be interfaced with the County's IT system
- Remove replace all room sensors/thermostats with BACstat sensors with display and adjustments
- Add Supply air and Fan status sensors to the new units

ECM Benefits

- Modest natural gas savings.
- Enhanced ability of the H&V units to heat and ventilate the space.

5.0 COST BENEFIT ANALYSIS

5.1 Life Cycle Cost Analysis

PG&E believes that implementing a comprehensive SST project at the identified facilities would enable San Luis Obispo County to implement a self-funded and low/no interest loan-funded project.

Several measures involve the replacement of equipment/systems that are at the end of their useful life and will need replacement in the foreseeable future. While the current analysis does not take this into account there are likely capital cost avoidance benefits for the replacement of this equipment which are not represented in the model below.

This section provides an overview of the Life Cycle Cost Analysis (LCCA) prepared for the recommended ECMs outlined in this IGA report, as summarized in the Executive Summary. The LCCA provides a comparison of two cases or scenarios - the base case and the retrofit condition. The LCCA calculates the net present value of each scenario over the expected life of the project. The analysis considers utility cost and associated escalation, initial construction cost, maintenance and capital avoidance costs over the life of the equipment. This analysis follows the procedures from the Federal Energy Management Program's "NIST Handbook 135 Life Cycle Cost Manual".

The key outcome of this analysis is the determination of the Savings to Investment Ratio (SIR) which is the ratio of the Net Present Value (NPV) savings of the Project over its lifetime and the Installation costs. A ratio greater than 1 indicates that investing in a retrofit to achieve reduction in energy use and costs is less costly than continuing in the path of the identified base case.

The energy escalation rate used in the LCCA is 5.0%. This is based on a PG&E Escalation Rate Report, which is used to project rates for the next 5 years. The results of the report were as follows:

"Given the current regulatory environment, PG&E's rates will likely continue to increase by 4 to 6 percent annually over the next five years."

O&M costs were developed by obtaining maintenance and repair records from the County's facility database for a period of 18 months. These records were compiled by site as well as by type of cost, and pro-rated to get an annual average cost.

The discount rate used in the LCCA is 3.5%, as direct by the County.

Table 5.1 provides a summary of the project's LCCA input factors/assumptions and Table 5.2 provides a summary of the LCCA results. The analysis shows that the project will produce an **SIR** of **1.64** (64% return on investment over the projects 20 year life cycle) and a total net savings of **$2,874,852** over 20 years. Tables 5.3 provides a 20-year annual cash flow for each case, baseline and post-retrofit.

Table 5.1: LCCA Inputs and Assumptions

Retrofit Life Cycle Cost Analysis Inputs

Client	**County of San Luis Obispo**	
Measure Description	Recommended IGA ECMs	
Base Date	9/30/2015	
Expected Life	20	yrs
Study Period	20	yrs
Energy Escalation	5	%
O&M Escalation	3	%
Discount Rate	3.5	%

Rates		
Electric	$ 0.1580	per kWh
Natural Gas	$ 0.6800	per therm
Water	$ -	per Gal

Energy Costs	Baseline (Status Quo)	Retrofit	
Electricity Use (kWh)	**7,722,936**	**6,130,912**	
Electricity Cost	$ 1,220,093	$ 968,580	
Renewable Energy Credit (0.02/kWh)	$ -	$ -	
Natural Gas Use (Therms)	**221,576**	**211,714**	
Natural Gas Cost	$ 150,672	$ 143,966	
Water (Gal)	0	0	
Water (Cost)	$ -	$ -	
Installed Cost	$ -	$ 4,527,159	
Utility Rebates & Incentives	$ -	$ 62,152	
Residual Value (15% of Installed Equipment Discounted at 3%)	$ -	$ -	
Initial Investment	$ -	$ 4,465,007	(Initial investment minus utility incentives.)
O&M	$ 76,227	$ -	
Capital Replacement	$ -	$ -	
Replacement Year	20	20	
Escalated Replacement Cost	$ -	$ -	

Table 5.2: LCCA Results

Retrofit Life Cycle Cost Analysis 9/30/2015

Client	County of San Luis Obispo
Project	Recommended IGA ECMs
Study Period	20 years

Summary		
NPV Baseline		$ 33,308,883
NPV Retrofit		$ 30,434,031
Net Savings		$ 2,874,852
SIR		1.64

Baseline

Cost Item	Cat	Description	Base Date Cost	Year of Occurrence	Discount Factor	Present Value
Initial Investment	1	Present value	$ -	0	1.000	$ -
Electricity Cost	6	Present value	$ 1,220,093	Annual	23.342	$ 28,479,391
Natural Gas Cost	6	Present value	$ 150,672	Annual	23.342	$ 3,516,976
Escalated Replacement Cost	1	Future value	$ -	20	0.503	$ -
O&M	3	Present value	$ 76,227	Annual	17.219	$ 1,312,516
Water (Cost)	6	Present value	$ -	Annual	23.342	$ -
Total LCC						$ 33,308,883

Retrofit

Cost Item	Cat	Description	Base Date Cost	Year of Occurrence	Discount Factor	Present Value
Initial Investment	1	Present value	$ 4,465,007	0	1.000	$ 4,465,007
Electricity Cost	6	Present value	$ 968,580	Annual	23.342	$ 22,608,583
Natural Gas Cost	6	Present value	$ 143,966	Annual	23.342	$ 3,360,441
Escalated Replacement Cost	1	Future value	$ -	20	0.503	$ -
O&M	3	Present value	$ -	Annual	17.219	$ -
Water (Cost)	6	Present value	$ -	Annual	23.342	$ -
Total LCC						$ 30,434,031

Table 5.3: LCCA Annual Cash Flows

Client **County of San Luis Obispo**
Measure **Recommended IGA ECMs**

Baseline Annual Cash Flow

Discount Rate	3.5%
Energy Escalation	5.0%
O&M Escalation	3.0%
Expected Life	20
Study Period	20

EXPENDITURE/RECEIPT	CAT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Initial / Replacement Cost		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cost Electricity (Base)			$1,220,093																			
Electricity Discount Factor	6		1.01	2.04	3.09	4.15	5.22	6.31	7.42	8.54	9.68	10.83	12.00	13.19	14.40	15.62	16.86	18.12	19.40	20.69	22.01	23.34
Annual Electric Costs PV		$ 28,479,391	$1,237,776	$1,255,714	$1,273,913	$1,292,376	$1,311,106	$1,330,107	$1,349,384	$1,368,940	$1,388,780	$1,408,907	$1,429,326	$1,450,041	$1,471,056	$1,492,376	$1,514,005	$1,535,947	$1,558,207	$1,580,789	$1,603,699	$1,626,941
Cost Natural Gas (Base)			$ 150,672																			
Natural Gas Discount Factor	6		1.01	2.04	3.09	4.15	5.22	6.31	7.42	8.54	9.68	10.83	12.00	13.19	14.40	15.62	16.86	18.12	19.40	20.69	22.01	23.34
Annual Natural Gas Costs PV		$ 3,516,976	$ 152,855	$ 155,071	$ 157,318	$ 159,598	$ 161,911	$ 164,258	$ 166,638	$ 169,053	$ 171,503	$ 173,989	$ 176,510	$ 179,068	$ 181,664	$ 184,296	$ 186,967	$ 189,677	$ 192,426	$ 195,215	$ 198,044	$ 200,914
O&M			$ 76,227																			
O&M Discount Factor	3		0.99	1.96	2.91	3.86	4.79	5.70	6.61	7.50	8.37	9.24	10.09	10.93	11.75	12.57	13.37	14.16	14.95	15.71	16.47	17.22
O&M PV		$ 1,312,516	$ 75,122	$ 74,034	$ 72,961	$ 71,903	$ 70,861	$ 69,834	$ 68,822	$ 67,825	$ 66,842	$ 65,873	$ 64,918	$ 63,977	$ 63,050	$ 62,136	$ 61,236	$ 60,348	$ 59,474	$ 58,612	$ 57,762	$ 56,925

Present Value **$ 33,308,883**

Retrofit Annual Cash Flow

Discount Rate	3.5%
Energy Escalation	5.0%
O&M Escalation	3.0%
Expected Life	20
Study Period	20

EXPENDITURE/RECEIPT	CAT	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Initial / Replacement Cost		$ 4,465,007	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Cost Electricity (Base)			$ 968,580																			
Electricity Discount Factor	6		1.01	2.04	3.09	4.15	5.22	6.31	7.42	8.54	9.68	10.83	12.00	13.19	14.40	15.62	16.86	18.12	19.40	20.69	22.01	23.34
Annual Electric Costs PV		$ 22,608,583	$ 982,618	$ 996,858	$1,011,306	$1,025,962	$1,040,831	$1,055,916	$1,071,219	$1,086,744	$1,102,494	$1,118,472	$1,134,682	$1,151,126	$1,167,809	$1,184,734	$1,201,904	$1,219,323	$1,236,994	$1,254,922	$1,273,109	$1,291,560
Cost Natural Gas (Base)			$ 143,966	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Natural Gas Discount Factor	6		1.01	2.04	3.09	4.15	5.22	6.31	7.42	8.54	9.68	10.83	12.00	13.19	14.40	15.62	16.86	18.12	19.40	20.69	22.01	23.34
Annual Natural Gas Costs PV		$ 3,360,441	$ 146,052	$ 148,169	$ 150,316	$ 152,495	$ 154,705	$ 156,947	$ 159,221	$ 161,529	$ 163,870	$ 166,245	$ 168,654	$ 171,098	$ 173,578	$ 176,094	$ 178,646	$ 181,235	$ 183,861	$ 186,526	$ 189,229	$ 191,972
O&M			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
O&M Discount Factor	3		0.99	1.96	2.91	3.86	4.79	5.70	6.61	7.50	8.37	9.24	10.09	10.93	11.75	12.57	13.37	14.16	14.95	15.71	16.47	17.22
O&M PV		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -

Present Value **$ 30,434,031**

Net Energy and O&M Savings	$ 3,428,660	$ 330,280	$ 332,889	$ 335,568	$ 338,316	$ 341,135	$ 344,026	$ 346,987	$ 350,021	$ 353,128	$ 356,308	$ 359,563	$ 362,892	$ 366,297	$ 369,778	$ 373,336	$ 376,972	$ 380,686	$ 384,479	$ 388,353	$ 392,307

6.0 PROJECT REBATES, GRANTS AND INCENTIVES

Many federal, state and local utility programs exist to motivate and encourage commercial, municipal and federal entities to implement energy and water conservation measures. These programs take many forms including grants, rebates, tax credits and performance based incentive programs. Each type of program has its own requirements which vary from the preparation of simple forms and providing purchasing documentation to very rigorous documentation, data collection and analysis efforts where the programs are “pay-for-performance” type.

6.1 Administering Incentive Programs

Incentives paid through programs administered by California’s investor owned utilities and paid from Public Good Funds collected from California utility rate payers have been a vital part of the California energy retrofit landscape for the past eighteen (18) years.

The PG&E SST team has secured more than $30 million in utility incentives for our turnkey project customers in the last five (5) years alone. Because of our strong in-house engineering expertise, we are viewed by the utilities as a partner in the effective use of public benefits funds. We are very familiar with the technical as well as administrative requirements of PG&E’s utility rebate programs available to San Luis Obispo County.

The PG&E SST team has been working closely with PG&E and SoCal Gas as development work on this project has progressed to identify the PG&E and SoCal Gas available incentive programs that will provide the most value and benefit to the County. The PG&E programs identified for measures currently under consideration in this IGA are the Business Rebate and Customized Retrofit Incentives Programs administered by PG&E. The applicable SoCal Gas program is the Energy Efficiency Calculated Incentive Program.

6.2 PG&E Incentive Programs

Business Rebate Program

PG&E has offered coordinated versions of performance based incentive programs for the past twelve years. The PG&E website is currently posting a document titled “2015 Business Rebate List” which highlights incentive levels for various measures that will be available during 2015.

This program pays incentives to customers who install high efficiency systems and components which save electricity and natural gas. A review of this new program reveals that the incentives from this program will be significant and could cover between 10 and 40% percent of the installation cost of a measure.

The following tables have been extracted from the latest program description document mentioned above and are provided to detail the key incentives for ECMs recommended in this IGA that will be available to the county in the coming years. For a comprehensive look at all incentives available, the document can be viewed at this website, www.pge.com/businessrebates.

Business Computing

Rebate Code	Description	Rebate/Unit Measure
M03	Network Desktop Computer Power Management Software	$15/desktop computer
L65	Plug Load Occupancy Sensors	$15/sensor

Cooling

Rebate Code	Description	Rebate/Unit Measure
F171	ENERGY STAR® Com. Glass Door Refrig. Internal volume < 15 ft³	$75/unit
F172	ENERGY STAR Com. Glass Door Refrig. Internal volume 15 ft³–29.9 ft³	$100/unit
F173	ENERGY STAR Com. Glass Door Refrig. Internal volume 30 ft³–49.9 ft³	$125/unit
F174	ENERGY STAR Com. Glass Door Refrig. Internal volume 50 ft³ or greater	$150/unit
F183	ENERGY STAR Com. Solid Door Refrig. Internal volume < 15 ft³	$50/unit
F184	ENERGY STAR Com. Solid Door Refrig. Internal volume 15 ft³–29.9 ft³	$75/unit
F185	ENERGY STAR Com. Solid Door Refrig. Internal volume 30 ft³–49.9 ft³	$125/unit
F186	ENERGY STAR Com. Solid Door Refrig. Internal volume 50 ft³ or greater	$200/unit
F179	ENERGY STAR Com. Solid Door Freezers Internal volume < 15 ft³	$100/unit
F180	ENERGY STAR Com. Solid Door Freezers Internal volume 15 ft³–29.9 ft³	$150/unit
F181	ENERGY STAR Com. Solid Door Freezers Internal volume 30 ft³–49.9 ft³	$300/unit
F182	ENERGY STAR Com. Solid Door Freezers Internal volume 50 ft³ or greater	$600/unit

Food Service (continued)

Cooling (continued)

Rebate Code	Description	Rebate/Unit Measure
F200	Super-Efficient Ice Machine 101–300 lbs/day	$100/unit
F201	Super-Efficient Ice Machine 301–500 lbs/day	$150/unit
F202	Super-Efficient Ice Machine 501–1,000 lbs/day	$250/unit
F203	Super-Efficient Ice Machine 1,001–1,500 lbs/day	$400/unit
F204	Super-Efficient Ice Machine > 1,500 lbs/day	$500/unit

Holding

Rebate Code	Description	Rebate/Unit Measure
F110	Insulated Holding Cabinet Full Size	$300/unit
F111	Insulated Holding Cabinet Half Size	$200/unit

Ventilation

Rebate Code	Description	Rebate/Unit Measure
F150	Demand Control Kitchen Ventilation Electric	$350/exh. fan hp

Heating, Ventilation and Air Conditioning (HVAC)

Rebate Code	Description	Rebate/Unit Measure
SA17	Central Natural Gas Furnace 95–96.9% AFUE without VSM	$150/unit
SA19	Central Natural Gas Furnace ≥ 97% AFUE without VSM	$250/unit
SA16	Central Natural Gas Furnace 95–96.9% AFUE with VSM	$200/unit
SA18	Central Natural Gas Furnace ≥ 97% AFUE with VSM	$300/unit
H148	Variable Frequency Drive (VFD) for HVAC Fan	$80/hp
H182	Replacement Multiple-Speed Brushless Permanent Magnet Blower Motor CZ restrictions apply	$50/unit
HA83	Replace Analog Economizer Control System with ADEC on Variable Air Volume Unit	$20/ton (max $300)
HA84	Replace Analog Economizer Control System with ADEC on Heat Pump Unit	$20/ton (max $300)
HA85	Replace Analog Economizer Control System with ADEC on AC or Gas Pack Unit	$20/ton (max $300)

Heating, Ventilation and Air Conditioning (HVAC) (continued)

Rebate Code	Description	Rebate/Unit Measure
HV026	Add Demand Controlled Ventilation (ADEC and CO2 Sensor) to Packaged HVAC Unit with Gas Heat	$100/ton (max $1,500)
HV028	Add Demand Controlled Ventilation (ADEC and CO2 Sensor) to Packaged AC Unit	$100/ton (max $1,500)
HV030	Add Demand Controlled Ventilation (ADEC and CO2 Sensor) to Heat Pump	$100/ton (max $1,500)
HV027	Add Demand Controlled Ventilation (CO2 Sensor) to Packaged HVAC Unit with Gas Heat with ADEC	$40/ton (max $600)
HV029	Add Demand Controlled Ventilation (CO2 Sensor) to Packaged AC Unit with ADEC	$40/ton (max $600)
HV031	Add Demand Controlled Ventilation (CO2 Sensor) to Heat Pump with ADEC	$40/ton (max $600)
SA13	Replace Solid V-Belts with Notched Belts on AC or Gas Pack Unit	$8/ton (max $30/motor)
SA14	Replace Solid V-Belts with Notched Belts on Heat Pump Unit	$8/ton (max $30/motor)
SA15	Replace Solid V-Belts with Notched Belts on Variable Air Volume Unit	$8/ton (max $30/motor)
SA07	Add Enhanced Ventilation Control (ADEC+CO2 Sensor+VFD) to Gas Pack Unit	$155/ton (max $3,875)
SA08	Add Enhanced Ventilation Control (ADEC+CO2 Sensor+VFD+NEMA Premium Motor) to Gas Pack Unit	$190/ton (max $4,750)
SA09	Add Enhanced Ventilation Control (ADEC+CO2 Sensor+VFD+Permanent Mag Motor) to Gas Pack Unit	$194/ton (max $4,850)
SA10	Add Enhanced Ventilation Control (ADEC+CO2 Sensor+VFD) to Heat Pump Unit	$155/ton (max $3,875)
SA11	Add Enhanced Ventilation Control (ADEC+CO2 Sensor+VFD+NEMA Premium Motor) to Heat Pump Unit	$190/ton (max $4,750)
SA12	Add Enhanced Ventilation Control (ADEC+CO2 Sensor+VFD+Permanent Mag Motor) to Heat Pump Unit	$194/ton (max $4,850)
T314	Replace Title 24-Nonconforming Thermostat with Conforming Programmable Thermostat on Package HVAC Unit	$14/ton (max $300)

Lighting

LED High Bay				
Rebate Code	Replacement Fixture Wattage	Recommended Existing Lamp Wattage/Type	Recommended Min. Repl. Fixture Lumens	Rebate/ Unit Measure
LD109	> 500–750 watt	1,000 watt PS-MH	43,400	$300/fixture
LD108	> 320–500 watt	750 watt PS-MH	32,300	$250/fixture
LD107	> 280–320 watt	450 watt PS-MH	23,900	$225/fixture
LD106	> 262–280 watt	400 watt PS-MH	21,600	$190/fixture
LD105	> 220–262 watt	350 watt PS-MH	15,800	$160/fixture
LD104	> 187–220 watt	320 watt PS-MH	12,900	$145/fixture
LD103	> 160–187 watt	250 watt PS-MH	11,200	$125/fixture
LD102	> 131–160 watt	200 watt PS-MH	9,600	$110/fixture
LD101	40–131 watt	175 watt PS-MH	6,200	$100/fixture
LD113	> 160–220 watt	T8 Fluorescent 2nd Gen 8L VHLO	11,200	$125/fixture
LD112	> 131–160 watt	T8 Fluorescent 2nd Gen 6L VHLO	9,600	$110/fixture
LD111	40–131 watt	T8 Fluorescent 2nd Gen 4L VHLO	6,200	$100/fixture

LED Exterior Area		
Rebate Code	Description	Rebate/Unit Measure
LT007	Install > 500-750 watt LED Fixture Replacing HID	$200/fixture
LT008	Install > 265-500 watt LED Fixture Replacing HID	$150/fixture
LT009	Install > 225-265 watt LED Fixture Replacing HID	$125/fixture
LT010	Install > 192-225 watt LED Fixture Replacing HID	$100/fixture
LT011	Install > 150-192 watt LED Fixture Replacing HID	$80/fixture
LT012	Install > 110-150 watt LED Fixture Replacing HID	$70/fixture
LT013	Install > 70-110 watt LED Fixture Replacing HID	$60/fixture
LT014	Install > 50-70 watt LED Fixture Replacing HID	$50/fixture
LT015	Install 0–50 watt LED Fixture Replacing HID	$40/fixture

Accent & Directional		
Rebate Code	Description	Rebate/Unit Measure
LD146	Replace with ≥ 25 watt LED Fixture	$30/fixture
LD145	Replace with 24 to < 25 watt LED Fixture	$30/fixture
LD144	Replace with 23 to < 24 watt LED Fixture	$30/fixture
LD143	Replace with 22 to < 23 watt LED Fixture	$30/fixture
LD142	Replace with 21 to < 22 watt LED Fixture	$30/fixture
LD141	Replace with 20 to < 21 watt LED Fixture	$30/fixture
LD140	Replace with 19 to < 20 watt LED Fixture	$30/fixture
LD139	Replace with 18 to < 19 watt LED Fixture	$30/fixture
LD138	Replace with 17 to < 18 watt LED Fixture	$25/fixture
LD137	Replace with 16 to < 17 watt LED Fixture	$25/fixture
LD136	Replace with 15 to < 16 watt LED Fixture	$25/fixture
LD135	Replace with 14 to < 15 watt LED Fixture	$25/fixture
LD134	Replace with 13 to < 14 watt LED Fixture	$25/fixture
LD133	Replace with 12 to < 13 watt LED Fixture	$25/fixture
LD132	Replace with 11 to < 12 watt LED Fixture	$20/fixture
LD131	Replace with 10 to < 11 watt LED Fixture	$20/fixture
LD130	Replace with 9 to < 10 watt LED Fixture	$20/fixture
LD129	Replace with 8 to < 9 watt LED Fixture	$15/fixture
LD128	Replace with 7 to < 8 watt LED Fixture	$15/fixture
LD127	Replace with < 7 watt LED Fixture	$15/fixture

Lighting (continued)

Linear Fluorescent

Rebate Code	Existing Lamp Wattage	Replacement Lamp Wattage	Rebate/Unit Measure
Linear Fluorescent Low-Wattage T8 Lamps			
L730	32 watt	28 watt	$1/lamp
L863	32 watt	25 watt	$1.50/lamp
Rebate Code	**Description**		**Rebate/Unit Measure**
Linear Fluorescent High-Bay Fixtures			
LT001	> 351–585 watt Linear Fluorescent (HP T8/T5) Fixture Replacing HID/Incandescent Lamp		$125/fixture
LT002	> 234–351 watt Linear Fluorescent (HP T8/T5) Fixture Replacing HID/Incandescent Lamp		$100/fixture
LT003	> 144–234 watt Linear Fluorescent (HP T8/T5) Fixture Replacing HID/Incandescent Lamp		$75/fixture
LT004	> 118–144 watt Linear Fluorescent (HP T8/T5) Fixture Replacing HID/Incandescent Lamp		$50/fixture
LT005	> 64–118 watt Linear Fluorescent (HP T8/T5) Fixture Replacing HID/Incandescent Lamp		$30/fixture
LT006	≤ 64 watt Linear Fluorescent (HP T8/T5) Fixture Replacing HID/Incandescent Lamp		$20/fixture

CFL High-Bay Fixtures

Rebate Code	Existing Lamp Wattage	Replacement Lamp Wattage	Rebate/Unit Measure
CFL Interior Fixtures			
L1014	400 watt	≤ 244 watt (Tier 1)	$35/fixture
L1013	400 watt	≤ 360 watt (Tier 2)	$20/fixture
L1022	176–399 watt	≤ 192 watt	$20/fixture
L1021	101–175 watt	≤ 128 watt	$20/fixture
L962	≤ 100 watt	≤ 70 watt	$10/fixture
CFL Exterior Fixture			
LA00	≤ 100 watt	≤ 70 watt	$10/fixture
Rebate Code	**Description**		**Rebate/Unit Measure**
CFL Screw-in Lamp			
L1005	14–28 watt Replacement Lamp		$5/lamp

Induction

Rebate Code	Existing Lamp Wattage	Replacement Lamp Wattage	Rebate/Unit Measure
Exterior Induction Fixtures			
L0265	400 watt	≤ 250 watt	$40/fixture
L0267	201–399 watt	≤ 180 watt	$25/fixture
L0264	176–200 watt	≤ 120 watt	$20/fixture
L0263	101–175 watt	≤ 100 watt	$15/fixture
L0262	≤ 100 watt	≤ 70 watt	$15/fixture
Interior Induction Fixtures			
L0270	400 watt	≤ 250 watt	$45/fixture
L1025	176–399 watt	≤ 180 watt	$30/fixture
L1024	101–175 watt	≤ 120 watt	$25/fixture
L1023	≤ 100 watt	≤ 70 watt	$12.50/fixture

Refrigeration

Rebate Code	Description	Rebate/Unit Measure
R7	Anti-Sweat Heater (ASH) Controls Medium Temp.	$25/linear ft.
HB31	Anti-Sweat Heater (ASH) Controls Low Temp.	$25/linear ft.
R79	Auto-Closers for Walk-in Cooler Doors	$75/closer
R80	Auto-Closers for Walk-in Freezer Doors	$75/closer
R145	Efficient Evaporator Fan Motor ECM Display Case	$35/motor
R176	Efficient Evaporator Fan Motor ECM Walk-in Coolers and Freezers	$50/motor
R53	Evaporator Fan Controller for Walk-in Coolers and Freezers	$75/controller
RFEE	High-Efficiency Refrigerator CEE Tier 3 Mid- and Full-Sized Refrigerators 7.75 cubic feet and above	$75/unit

Coolers and Freezers

Rebate Code	Description	Rebate/Unit Measure
R87	New High-Efficiency Refrigeration Display Cases w/Spec. Doors Low Temperature	$75/linear ft.
R4	New Refrigeration Display Case with Doors Low Temperature	$175/linear ft.
R5	New Refrigeration Display Case with Doors Medium Temperature	$75/linear ft.
R1	Night Covers for Display Cases Low Temperature	$3.50/linear ft.
R74	Night Covers for Display Cases Medium Temperature	$3.50/linear ft.
R6	Special Doors with Low/No Anti-Sweat Heat on Low-Temperature Display Cases	$100/door
R86	Vending Machine Controller	$100/controller

Customized Retrofit Incentive Program

For measures that do not fit into the above Business Rebate Program, a customized incentive program is also available. The Customized Retrofit Incentive Program works as follows:

1. Application Submission. The Project Sponsor submits an application to the Utility Administrator. The application submission contains project details and any other supporting documentation as deemed necessary by the Utility Administrator.
2. Application Review. The Utility Administrator-assigned Reviewer evaluates the application and conducts a pre-installation site inspection. At the Utility Administrator's sole discretion the pre-installation site inspection may be waived. The Reviewer will

evaluate and may revise the submitted energy savings and/or incentive calculation. The Utility Administrator may require the Project Sponsor to submit an M&V plan, if the Utility Administrator determines at its sole discretion that an M&V process is appropriate for the proposed project.

3. Application Approval. If the application is approved by the Utility Administrator, incentive funding for the project is reserved and the Project Sponsor and Utility Administrator enter into a Project Agreement that defines the energy savings and incentive payment. Measure equipment may not be purchased or installed before the Utility Administrator has provided written notice to proceed.
4. Project Installation. The Project Sponsor notifies the Utility Administrator in writing and submits invoices and required permit/license certification form(s) after all project measure(s) have been installed, are fully commissioned, and fully operational.
5. Installation Review. Upon receipt of Installation Report (SCE and SDG&E), or Installation notification (PG&E and SCG), the Reviewer will evaluate the submittal package and conduct a post-installation inspection to verify project installation and ensure the scope of work has not altered from the agreed-upon project. Based on special circumstances the Utility Administrator, at their sole discretion, may waive the post installation site inspection.
6. Incentive Payment. Upon Utility Administrator's approval of the Installation Review, the indicated Payee receives the incentive payment. In most circumstances, projects are paid at 100 percent of the approved incentive upon project completion and Installation Review approval.

The Statewide Customized Retrofit Offering accepts a wide variety of energy-saving projects, including a pre-defined list of common measures as well as custom-designed measures. All projects must meet the following criteria:

1. Must Exceed Baseline Energy Performance. Incentives are paid on the energy savings and demand reduction above and beyond baseline energy performance, which include state-mandated codes, federal-mandated codes, industry-accepted performance standards, or other baseline energy performance standards as determined by the Utility Administrator.

2. Must Meet CPUC Mandated DEER Peak Demand Definition. Incentives for demand reduction (kW) are paid only on permanent electrical demand which is reduced during peak periods, as defined by Database for Energy Efficiency Resources (DEER).
3. Must Operate at Least Five Years. The Project Agreement requires that the new equipment or system retrofit must provide energy savings for a minimum of five years. Measures with an effective useful life of less than five years are ineligible. Retrofit Add on projects consider the effective useful life of the source equipment as well as the add on equipment.
4. Must Be Permanently Installed. Measures that are not permanently installed or can be easily removed, as determined by the Utility Administrator, are ineligible for Customized Retrofit incentives.
5. Cannot Overlap Other Incentive Programs. Any measures included in the application cannot be applied through multiple California energy efficiency incentive or rebate programs. Gas and Electric components should be considered separately. Other California end user energy efficiency programs include, but are not limited to, any program offered by or through PG&E, SCE, SCG, SDG&E, California Energy Commission (CEC), and California Public Utilities Commission (CPUC), including PPP funded local programs, third-party programs, or local government partnerships. Applicants cannot receive incentives from more than one energy efficiency program for the same measures. Contact the Utility Administrator for further details.
6. Baseline Equipment Must Be Decommissioned and Removed. The baseline equipment must be decommissioned and removed from site prior to Installation Review approval. Under certain circumstances and subject to Utility Administrator discretion, baseline equipment may be kept on site. Additional documentation or verification may be required in these cases to verify the need or the circumstances for retaining the baseline equipment.
7. No Equivalent Deemed/Express Offering. Customized Retrofit incentives will only be available to the customer when the measure does not meet requirements of the Deemed Rebate program and if the project has not been installed.
8. Must Include Significant Installation of New Equipment. Measures that, at the Utility Administrator's discretion, save

energy primarily due to operational changes (e.g. control recoding, reprogramming, set point changes) or routine repair/maintenance do not qualify for the Customized Retrofit program. These measures are better suited to utility Retro-commissioning programs.

9. Project applications must demonstrate energy savings that earn an incentive of at least $2,000 to be considered for program eligibility.

Measures are classified as Lighting, Non-Lighting. Lighting and Non-Lighting measures are further organized into either Basic or Targeted categories. Basic measures are generally well-established and broadly implemented. Targeted measures generally are newer, less-established technologies or have experienced market barriers in certain segments. The Targeted measures are paid at a higher incentive to encourage better market penetration. Generally, Targeted Non-Lighting measures are wholesale HVAC or Refrigeration system change-outs that result in improved overall system efficiency (e.g. kW/ton improvements), whereas Basic Non-Lighting measures are HVAC/Refrigeration, controls or process measures that involve add-ons or component replacements resulting in reduced operation or load. The tables below provide an illustrative (not a comprehensive) list of qualifying efficiency measures, and the associated incentive rates:

Basic Lighting **Energy - $0.03 / kWh** **Peak Demand - $150 / kW**	▪ Interior and exterior lighting retrofits including xenon, linear fluorescent, HID, induction, cold cathode and compact fluorescent fixtures (not including screw-in lamps) that do not meet the Deemed/Express program criteria. ▪ High efficiency signage or architectural lighting ▪ Standard controls including Occupancy Sensors, Photocells, and Timers when not accompanied by a luminaire modification. Most control installations accompanying luminaire modifications are required by code and therefore ineligible. ▪ Dimming ballast with less than three of the strategies identified in advanced / targeted.
Targeted Lighting **Energy - $0.08 / kWh** **Peak Demand - $150 / kW**	▪ LED products on the statewide Qualified Products List (QPL), www.lightingfacts.com/ca, that do not meet the Deemed/Express program criteria. ▪ Lighting Control Systems with at least three of the following controls strategies: (Scheduling, Daylighting, Occupant Sensing, Task Tuning, Demand Response) when not accompanied by a luminaire modification. Most control installations accompanying luminaire modifications are required by code and therefore ineligible. ▪ **SDG&E only**: Emerging Technologies

Basic Non-Lighting **Energy – $0.08 / kWh** **Peak Demand $150 / kW**	**HVAC** ▪ Cooling tower replacement (A/C or Refrigeration) ▪ Condenser replacement (A/C or Refrigeration) ▪ Controls and energy management systems for HVAC or refrigeration equipment ▪ Demand control ventilation installation (CO2 sensors) ▪ Air Conditioner air-side or water-side economizer installations on units not already equipped with a 100% economizer ▪ Variable speed drives on fans (including supply fans, exhaust fans, and cooling tower fans) ▪ Variable speed drives on pump motors (including chilled water and cooling tower pumps) ▪ Motor or fan upgrades ▪ Insulating cool air ducts **REFRIGERATION** ▪ Refrigeration evaporator fan controls ▪ Insulating chilled water, condenser water, or refrigerant pipes ▪ Installation of high-speed cold storage doors (Rapid Close Doors) ▪ Refrigerated case doors ▪ **PG&E and SDG&E only**: Refrigeration scroll compressor replacements for bulk tanks **PROCESS** ▪ Variable-speed drives (e.g., on industrial fans, industrial pumps, and on air compressor motors) ▪ Industrial process applications ▪ Projects improving building hot water efficiency ▪ Water flow controls resulting in electric savings ▪ Exhaust hood and fan projects ▪ Dairy Vacuum Pumps/ Variable-speed drives (VSDs) ▪ Pulse cooling devices for injection molding machines ▪ Injection molding machines ▪ Professional wet cleaning equipment ▪ Thin Client Computing Architecture ▪ SCADA systems enabling electric savings ▪ Air Compressor system upgrades including compressor replacement, intermediate flow control, and added receiver capacity ▪ **PG&E and SCE only**: Advanced Air Compressor Controls for two or more compressors ▪ **PG&E and SCE only**: VAV laboratory exhaust system installation ▪ **PG&E, SCE and SDG&E (Non Agriculture Sites only)**: Pump Replacements or Upgrades ▪ **PG&E only:** Building-wide EMS enabling electric savings ▪ Building shell improvements ▪ Window films and glazing

Targeted Non-Lighting **Energy - $0.15 / kWh** **Peak Demand - $150 / kW**	**HVAC** ▪ High-efficiency water-cooled and air-cooled chillers replacements ▪ Variable Speed Drive installations on existing air conditioning or refrigeration compressor motors. ▪ **SDG&E and PG&E only:** Water source heat pumps (WSHP) of any size ▪ Constant air volume to variable air volume conversions ▪ Chiller heat reclaim ▪ Evaporative cooling unit installations ▪ Evaporative pre-cooling unit installations ▪ Indirect evaporative cooling (single stage and dual stage) ▪ Heat transfer (including heat pumps) to heat sinks, such as ground source cooling in air-conditioned buildings ▪ Variable Refrigerant Flow (VRF) system ▪ Air-cooled to evaporative condensers ▪ Oversized condenser installation ▪ Compressor replacement (A/C or Refrigeration) ▪ **SDG&E only:** VAV laboratory exhaust system installation ▪ **SDG&E and SCE only**: Whole Building EMS ▪ **SDG&E and PG&E only:** Packaged air conditioner and heat pumps greater than 760,000 Btu/hr or 63.3 tons **REFRIGERATION** ▪ Refrigeration floating head controller installations ▪ Variable Speed Drive installations on existing air conditioning or refrigeration compressor motors. ▪ Air-cooled to evaporative condensers ▪ Oversized condenser installation ▪ Compressor replacement (A/C or Refrigeration) **PROCESS** ▪ Process cooling packaged or split system air conditioning units and heat pumps of any size. ▪ Data center free cooling ▪ Air-cooled to evaporative condensers ▪ Oversized condenser installation ▪ Centrifugal to Vertical Turbine Pumps (for Agricultural only) ▪ **SCE only:** Refrigeration scroll compressor replacements for bulk tanks ▪ **SDG&E only:** Advanced Air Compressor Controls for two or more compressors ▪ **SDG&E Agriculture only:** Pump Replacements or Upgrades ▪ **SDG&E and PG&E only:** Water source heat pumps (WSHP) of any size

To qualify for these PG&E incentive funds the customer must meet the program requirements which include an application, providing proof(s) of purchase, and additional documentation. The application's terms and conditions state that a post inspection will be necessary to verify product installations, and that energy savings calculations may be required as part of the submission process. Completion of these incentive applications is included in our scope of work. Typically, the experience with past PG&E programs has been that a varying amount of measurement and verification (M&V) is required to validate the savings achieved. The amount of M&V required will vary depending on the complexity and savings of the measure. M&V is discussed further in the Performance Assurance section of this report.

Energy savings which qualify for the program must meet applicable minimum State and Federal efficiency standards. Therefore it is likely that the County will realize greater actual energy savings from a retrofit than it can receive incentives for if the current equipment is less efficient than the current minimum efficiency standard. When a retrofit is replacing very old systems this will generally be the case.

Current program descriptions do not detail to any significant extent payment procedures. However, the incentives paid by last year's Customized Retrofit Incentives program were paid in two payments. The first payment was made upon installation of the measure and approval of the installation submittal and typically amounted to 60% of the projected incentives. Before this payment is made PG&E or a third party will complete an inspection of the new equipment to make sure the installation is complete and that the old equipment has been removed.

The second and final payment will be made upon approval of the Operating Report (which includes reporting of the M&V results if the project or measure requires M&V). The Operating Report will be prepared by the PG&E SST team. This payment will be based on the energy savings determined through the M&V process and can be less than the original estimated incentive amount if the actual savings are less than originally expected. The final payment cannot exceed the originally approved incentive amount.

6.3 SoCal Gas Incentive Programs

For all measure that save natural gas, the SoCal Gas Energy Efficiency Calculated Incentive Program is applicable, which offers financial incentives and recognition awards for a variety of projects that save energy.

The incentive payment for qualifying projects amounts to the following (whichever is less):

- $1 per therm saved annually, or
- 50 percent of the project cost (excluding taxes and internal labor).

Incentives can be as high as $1 million per project and $2 million per premise, per year. For qualifying projects saving at least 1 million therms a year, the customer and SoCal Gas may negotiate on an incentive.

SoCalGas is offering this incentive program to most of its business customers, including agricultural, commercial, industrial and chain account customers. These customers may qualify for incentives through any combination of the following types of energy-efficiency projects:

- Equipment replacements
- Improvements of existing processes
- New energy-efficient equipment, processes or construction.

A key qualification for financial incentives is that SoCalGas must be involved from the beginning of the process, prior to equipment selection or final project design.

Program Specifics

Retrofit projects saving less than an estimated 200,000 therms per year require an energy analysis, which may include load balance calculations, account history and engineering review.

Retrofit projects saving greater than an estimated 200,000 therms per year will require the customer to provide an energy analysis report approved by a registered professional engineer.

For other retrofit projects and new construction projects, SoCalGas will provide customers with an energy savings report at no cost.

Leased equipment projects will be evaluated on a case-by-case basis, subject primarily to the terms of the lease.

Getting Started

Under this program, customers will need to follow a multi-step process using forms supplied specifically for this program by account representatives. The forms are submitted to SoCalGas for review and approval prior to purchasing the equipment. Additionally, pre- and post-inspections may be required. Customers work closely with SoCalGas to facilitate the review and payment process.

Application Process

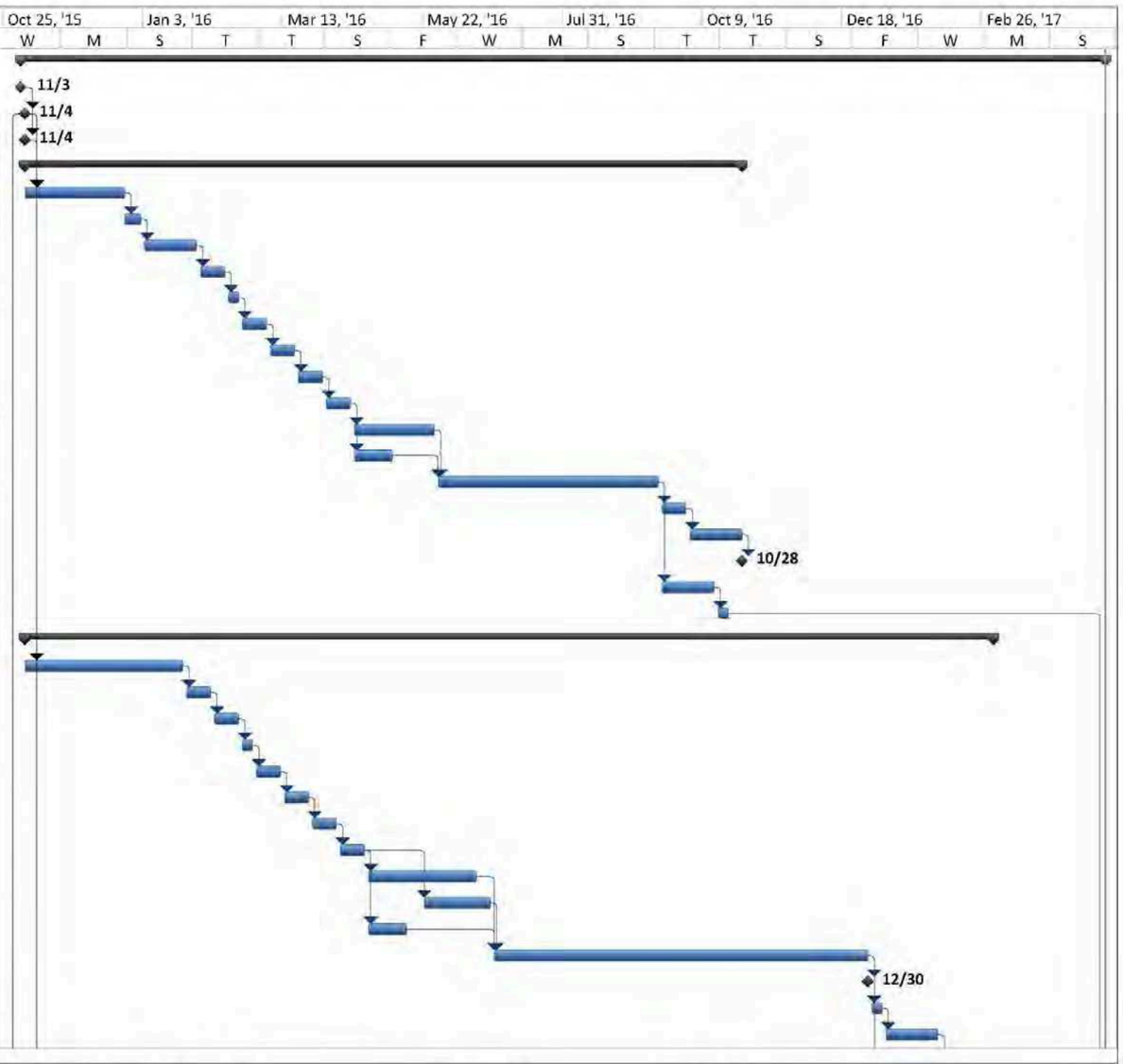
1. Contact your account representative to submit an application.

2. Subject the project to an energy analysis.
3. Proceed with purchase orders and/or equipment purchases.
4. Sign a conditional incentive reservation form.
5. Install equipment.
6. Complete and submit project closure paperwork.
7. Receive payment or recognition award.

7.0 PROJECT DESIGN AND CONSTRUCTION SCHEDULE

Please see below for an estimated schedule of design and construction for all recommended ECMs, predicated on execution of a design-build contract and a notice to proceed issued by November 4, 2015. For the all measures, costs are guaranteed until December 1, 2015.

ID	Task Name	Duration	Start	Finish
1	**County of SLO SST Design Build Project**	**389 days**	**Tue 11/3/15**	**Fri 4/28/17**
2	County Board of Supervisors Meeting	0 days	Tue 11/3/15	Tue 11/3/15
3	Notice to Proceed - OBF & County Funded Measures	0 days	Wed 11/4/15	Wed 11/4/15
4	Notice to Proceed - CEC Funded Measures	0 days	Wed 11/4/15	Wed 11/4/15
5	**Lighting at Various Buildings**	**257 days**	**Thu 11/5/15**	**Fri 10/28/16**
6	Prepare Design Documents	36 days	Thu 11/5/15	Thu 12/24/15
7	Christmas Break	6 days	Fri 12/25/15	Fri 1/1/16
8	County Design Review	20 days	Mon 1/4/16	Fri 1/29/16
9	Submit Final Design Docs	10 days	Mon 2/1/16	Fri 2/12/16
10	Plan Check & Permit	5 days	Mon 2/15/16	Fri 2/19/16
11	Generate Material Submittals	10 days	Mon 2/22/16	Fri 3/4/16
12	County Submittal Review	10 days	Mon 3/7/16	Fri 3/18/16
13	Resubmittals (if neccessary)	10 days	Mon 3/21/16	Fri 4/1/16
14	County Submittal Approval	10 days	Mon 4/4/16	Fri 4/15/16
15	Order Materials - Lead Time	30 days	Mon 4/18/16	Fri 5/27/16
16	Schedule Work/Outages with Building Occupants	15 days	Mon 4/18/16	Fri 5/6/16
17	Installation	80 days	Mon 5/30/16	Fri 9/16/16
18	Commissioning/ Punchlist	10 days	Mon 9/19/16	Fri 9/30/16
19	Training/ Closeout Docs	20 days	Mon 10/3/16	Fri 10/28/16
20	Substantial Completion	0 days	Fri 10/28/16	Fri 10/28/16
21	Gather M&V Data	20 days	Mon 9/19/16	Fri 10/14/16
22	Prepare M&V Report	5 days	Mon 10/17/16	Fri 10/21/16
23	**Downtown Central Plant**	**347 days**	**Thu 11/5/15**	**Fri 3/3/17**
24	Prepare Design Documents	57 days	Thu 11/5/15	Fri 1/22/16
25	County Design Review	10 days	Mon 1/25/16	Fri 2/5/16
26	Submit Final Design Docs	10 days	Mon 2/8/16	Fri 2/19/16
27	Plan Check & Permit	5 days	Mon 2/22/16	Fri 2/26/16
28	Generate Material Submittals	10 days	Mon 2/29/16	Fri 3/11/16
29	County Submittal Review	10 days	Mon 3/14/16	Fri 3/25/16
30	Resubmittals (if neccessary)	10 days	Mon 3/28/16	Fri 4/8/16
31	County Submittal Approval	10 days	Mon 4/11/16	Fri 4/22/16
32	Order Materials - Lead Time	40 days	Mon 4/25/16	Fri 6/17/16
33	Selective Demolition	25 days	Mon 5/23/16	Fri 6/24/16
34	Schedule Work/Outages with Building Occupants	15 days	Mon 4/25/16	Fri 5/13/16
35	Installation	135 days	Mon 6/27/16	Fri 12/30/16
36	Utility Inspection	0 days	Fri 12/30/16	Fri 12/30/16
37	Commissioning/ Punchlist	5 days	Mon 1/2/17	Fri 1/6/17
38	Training/ Closeout Docs	20 days	Mon 1/9/17	Fri 2/3/17



Project: Co SLO Design Build Sche
Date: Fri 10/16/15

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only
Summary	Inactive Task	Duration-only	Finish-only

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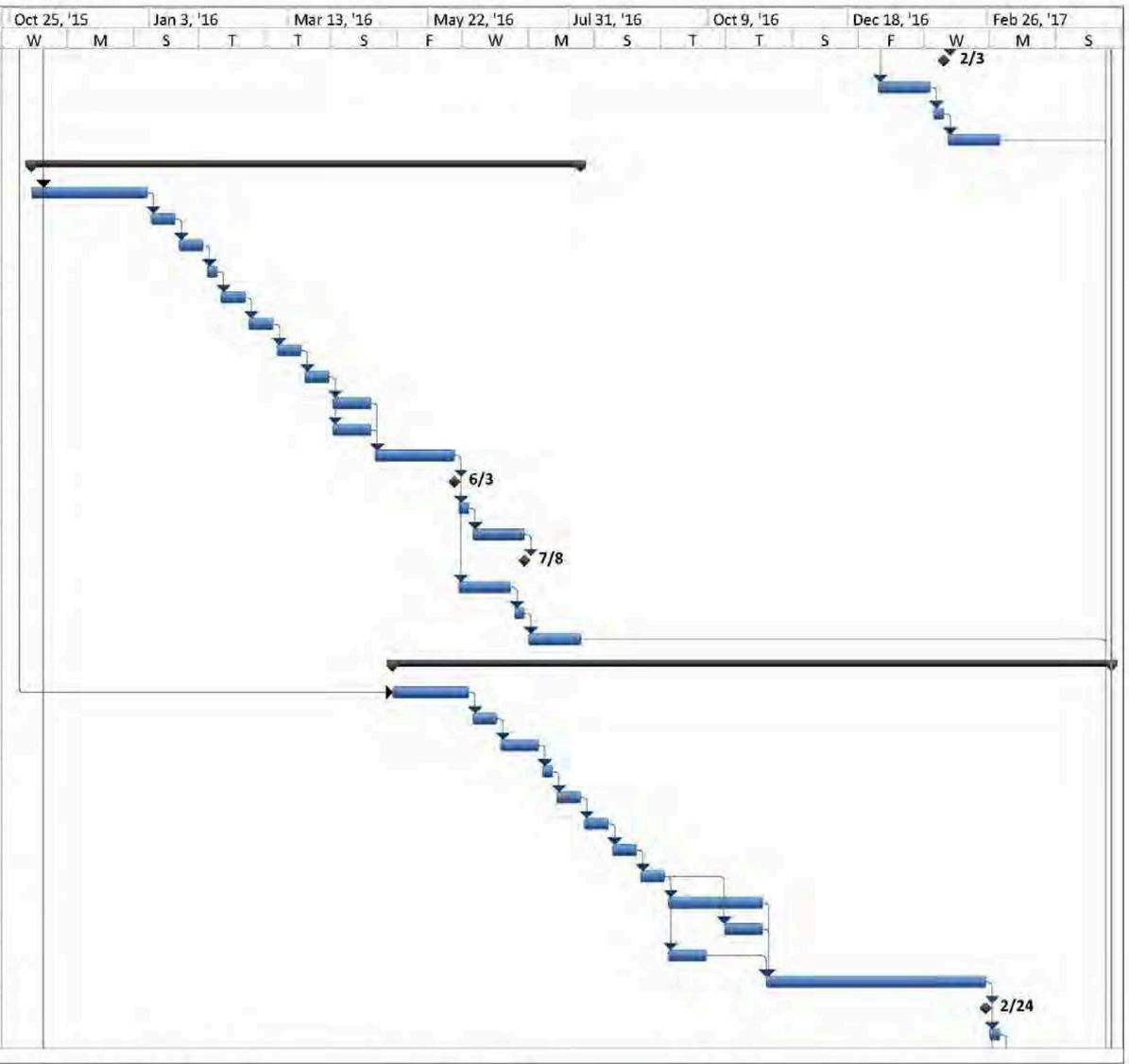
ID	Task Name	Duration	Start	Finish
39	Substantial Completion	0 days	Fri 2/3/17	Fri 2/3/17
40	Gather M&V Data	20 days	Mon 1/2/17	Fri 1/27/17
41	Prepare M&V Report	5 days	Mon 1/30/17	Fri 2/3/17
42	Utility Review and Approval	20 days	Mon 2/6/17	Fri 3/3/17
43	**Downtown Variable Flow CHW & HHW**	**197 days**	**Thu 11/5/15**	**Fri 8/5/16**
44	Prepare Design Documents	42 days	Thu 11/5/15	Fri 1/1/16
45	County Design Review	10 days	Mon 1/4/16	Fri 1/15/16
46	Submit Final Design Docs	10 days	Mon 1/18/16	Fri 1/29/16
47	Plan Check & Permit	5 days	Mon 2/1/16	Fri 2/5/16
48	Generate Material Submittals	10 days	Mon 2/8/16	Fri 2/19/16
49	County Submittal Review	10 days	Mon 2/22/16	Fri 3/4/16
50	Resubmittals (if neccessary)	10 days	Mon 3/7/16	Fri 3/18/16
51	County Submittal Approval	10 days	Mon 3/21/16	Fri 4/1/16
52	Order Materials - Lead Time	15 days	Mon 4/4/16	Fri 4/22/16
53	Schedule Work/Outages with Building Occupants	15 days	Mon 4/4/16	Fri 4/22/16
54	Installation	30 days	Mon 4/25/16	Fri 6/3/16
55	Utility Inspection	0 days	Fri 6/3/16	Fri 6/3/16
56	Commissioning/ Punchlist	5 days	Mon 6/6/16	Fri 6/10/16
57	Training/ Closeout Docs	20 days	Mon 6/13/16	Fri 7/8/16
58	Substantial Completion	0 days	Fri 7/8/16	Fri 7/8/16
59	Gather M&V Data	20 days	Mon 6/6/16	Fri 7/1/16
60	Prepare M&V Report	5 days	Mon 7/4/16	Fri 7/8/16
61	Utility Review and Approval	20 days	Mon 7/11/16	Fri 8/5/16
62	**Health Campus Central Plant**	**258 days**	**Wed 5/4/16**	**Fri 4/28/17**
63	Prepare Design Documents	28 days	Wed 5/4/16	Fri 6/10/16
64	County Design Review	10 days	Mon 6/13/16	Fri 6/24/16
65	Submit Final Design Docs	15 days	Mon 6/27/16	Fri 7/15/16
66	Plan Check & Permit	5 days	Mon 7/18/16	Fri 7/22/16
67	Generate Material Submittals	10 days	Mon 7/25/16	Fri 8/5/16
68	County Submittal Review	10 days	Mon 8/8/16	Fri 8/19/16
69	Resubmittals (if neccessary)	10 days	Mon 8/22/16	Fri 9/2/16
70	County Submittal Approval	10 days	Mon 9/5/16	Fri 9/16/16
71	Order Materials - Lead Time	35 days	Mon 9/19/16	Fri 11/4/16
72	Selective Demolition	15 days	Mon 10/17/16	Fri 11/4/16
73	Schedule Work/Outages with Building Occupants	15 days	Mon 9/19/16	Fri 10/7/16
74	Installation	80 days	Mon 11/7/16	Fri 2/24/17
75	Utility Inspection	0 days	Fri 2/24/17	Fri 2/24/17
76	Commissioning/ Punchlist	5 days	Mon 2/27/17	Fri 3/3/17



Project: Co SLO Design Build Sche
Date: Fri 10/16/15

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only
Summary	Inactive Task	Duration-only	Finish-only

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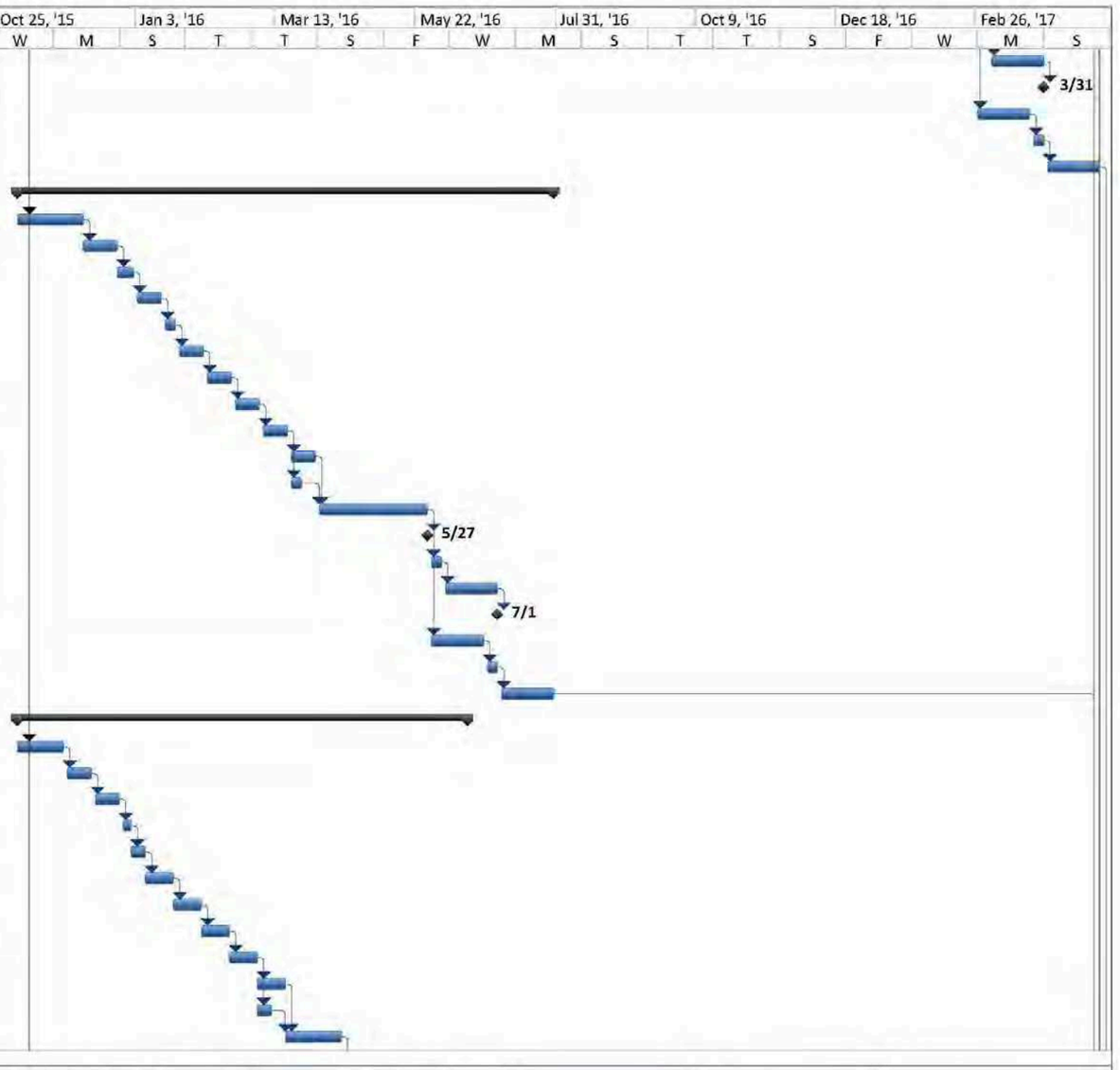
ID	Task Name	Duration	Start	Finish
77	Training/ Closeout Docs	20 days	Mon 3/6/17	Fri 3/31/17
78	Substantial Completion	0 days	Fri 3/31/17	Fri 3/31/17
79	Gather M&V Data	20 days	Mon 2/27/17	Fri 3/24/17
80	Prepare M&V Report	5 days	Mon 3/27/17	Fri 3/31/17
81	Utility Review and Approval	20 days	Mon 4/3/17	Fri 4/28/17
82	**New Government Center Underfloor Distribution**	**192 days**	**Thu 11/5/15**	**Fri 7/29/16**
83	Prepare Design Documents	23 days	Thu 11/5/15	Mon 12/7/15
84	County Design Review	13 days	Tue 12/8/15	Thu 12/24/15
85	Christmas Break	6 days	Fri 12/25/15	Fri 1/1/16
86	Submit Final Design Docs	10 days	Mon 1/4/16	Fri 1/15/16
87	Plan Check & Permit	5 days	Mon 1/18/16	Fri 1/22/16
88	Generate Material Submittals	10 days	Mon 1/25/16	Fri 2/5/16
89	County Submittal Review	10 days	Mon 2/8/16	Fri 2/19/16
90	Resubmittals (if neccessary)	10 days	Mon 2/22/16	Fri 3/4/16
91	County Submittal Approval	10 days	Mon 3/7/16	Fri 3/18/16
92	Order Materials - Lead Time	10 days	Mon 3/21/16	Fri 4/1/16
93	Schedule Work/Outages with Building Occupants	5 days	Mon 3/21/16	Fri 3/25/16
94	Installation	40 days	Mon 4/4/16	Fri 5/27/16
95	Utility Inspection	0 days	Fri 5/27/16	Fri 5/27/16
96	Commissioning/ Punchlist	5 days	Mon 5/30/16	Fri 6/3/16
97	Training/ Closeout Docs	20 days	Mon 6/6/16	Fri 7/1/16
98	Substantial Completion	0 days	Fri 7/1/16	Fri 7/1/16
99	Gather M&V Data	20 days	Mon 5/30/16	Fri 6/24/16
100	Prepare M&V Report	5 days	Mon 6/27/16	Fri 7/1/16
101	Utility Review and Approval	20 days	Mon 7/4/16	Fri 7/29/16
102	**Honor Farm Kitchen Hood Controls**	**161 days**	**Thu 11/5/15**	**Thu 6/16/16**
103	Prepare Design Documents	17 days	Thu 11/5/15	Fri 11/27/15
104	County Design Review	10 days	Mon 11/30/15	Fri 12/11/15
105	Submit Final Design Docs	10 days	Mon 12/14/15	Fri 12/25/15
106	Christmas Break	4 days	Mon 12/28/15	Thu 12/31/15
107	Plan Check & Permit	5 days	Fri 1/1/16	Thu 1/7/16
108	Generate Material Submittals	10 days	Fri 1/8/16	Thu 1/21/16
109	County Submittal Review	10 days	Fri 1/22/16	Thu 2/4/16
110	Resubmittals (if neccessary)	10 days	Fri 2/5/16	Thu 2/18/16
111	County Submittal Approval	10 days	Fri 2/19/16	Thu 3/3/16
112	Order Materials - Lead Time	10 days	Fri 3/4/16	Thu 3/17/16
113	Schedule Work/Outages with Building Occupants	5 days	Fri 3/4/16	Thu 3/10/16
114	Installation	20 days	Fri 3/18/16	Thu 4/14/16



Project: Co SLO Design Build Sche
Date: Fri 10/16/15

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only
Summary	Inactive Task	Duration-only	Finish-only

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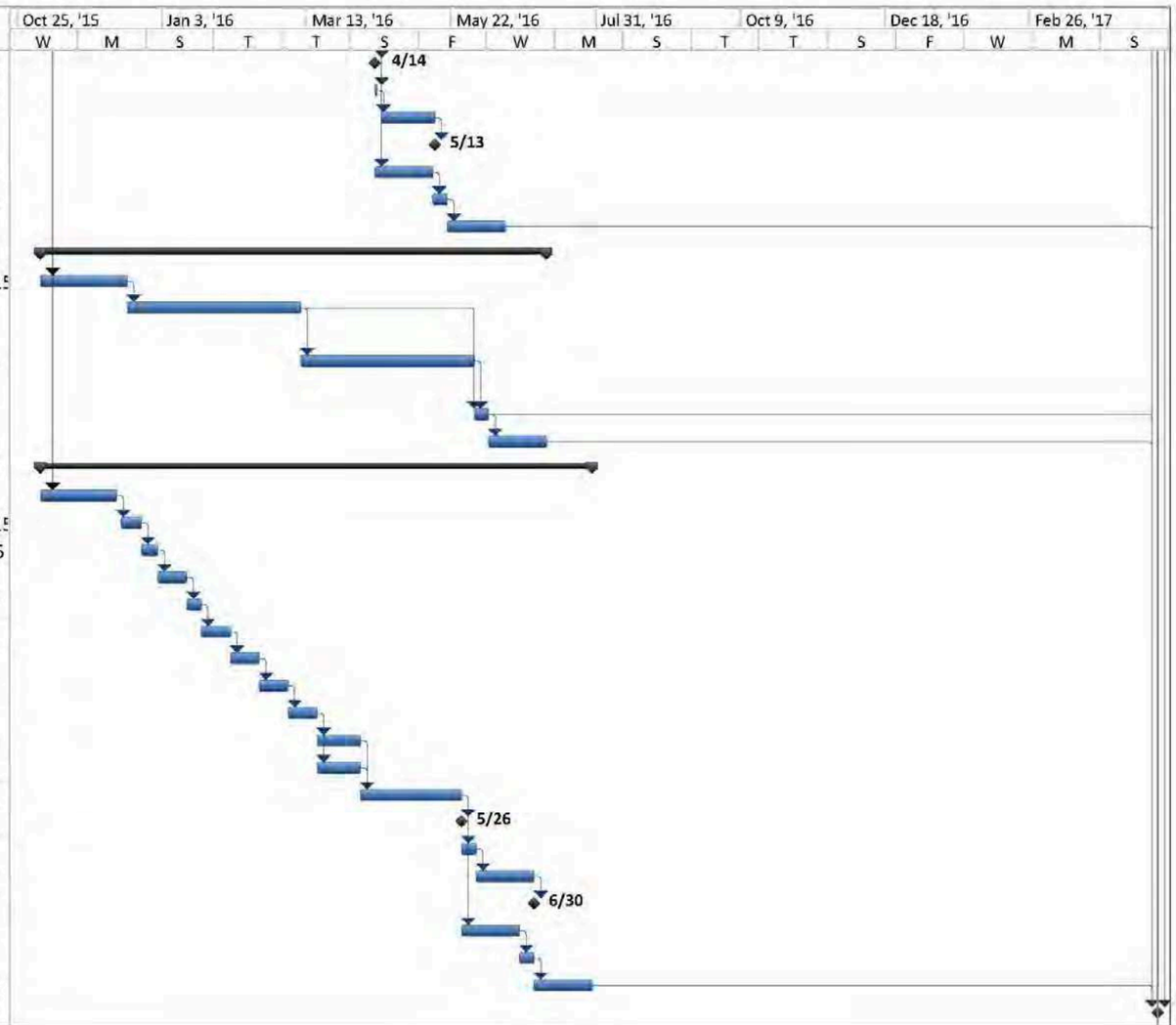
ID	Task Name	Duration	Start	Finish
115	Utility Inspection	0 days	Thu 4/14/16	Thu 4/14/16
116	Commissioning/ Punchlist	1 day	Fri 4/15/16	Fri 4/15/16
117	Training/ Closeout Docs	20 days	Mon 4/18/16	Fri 5/13/16
118	Substantial Completion	0 days	Fri 5/13/16	Fri 5/13/16
119	Gather M&V Data	20 days	Fri 4/15/16	Thu 5/12/16
120	Prepare M&V Report	5 days	Fri 5/13/16	Thu 5/19/16
121	Utility Review and Approval	20 days	Fri 5/20/16	Thu 6/16/16
122	**PC EMS**	**175 days**	**Thu 11/5/15**	**Wed 7/6/16**
123	Surveyor - Establish Baseline	30 days	Thu 11/5/15	Wed 12/16/15
124	Deploy Microsoft System Configuration Manager - Planning	60 days	Thu 12/17/15	Wed 3/9/16
125	Deploy Microsoft System Configuration Manager - General Services	60 days	Thu 3/10/16	Wed 6/1/16
126	Prepare M&V Report	5 days	Thu 6/2/16	Wed 6/8/16
127	Utility Review and Approval	20 days	Thu 6/9/16	Wed 7/6/16
128	**EMCS Expansion**	**191 days**	**Thu 11/5/15**	**Thu 7/28/16**
129	Prepare Design Documents	27 days	Thu 11/5/15	Fri 12/11/15
130	County Design Review	8 days	Mon 12/14/15	Wed 12/23/15
131	Christmas Break	6 days	Thu 12/24/15	Thu 12/31/15
132	Submit Final Design Docs	10 days	Fri 1/1/16	Thu 1/14/16
133	Plan Check & Permit	5 days	Fri 1/15/16	Thu 1/21/16
134	Generate Material Submittals	10 days	Fri 1/22/16	Thu 2/4/16
135	County Submittal Review	10 days	Fri 2/5/16	Thu 2/18/16
136	Resubmittals (if neccessary)	10 days	Fri 2/19/16	Thu 3/3/16
137	County Submittal Approval	10 days	Fri 3/4/16	Thu 3/17/16
138	Order Materials - Lead Time	15 days	Fri 3/18/16	Thu 4/7/16
139	Schedule Work/Outages with Building Occupants	15 days	Fri 3/18/16	Thu 4/7/16
140	Installation	35 days	Fri 4/8/16	Thu 5/26/16
141	Utility Inspection	0 days	Thu 5/26/16	Thu 5/26/16
142	Commissioning/ Punchlist	5 days	Fri 5/27/16	Thu 6/2/16
143	Training/ Closeout Docs	20 days	Fri 6/3/16	Thu 6/30/16
144	Substantial Completion	0 days	Thu 6/30/16	Thu 6/30/16
145	Gather M&V Data	20 days	Fri 5/27/16	Thu 6/23/16
146	Prepare M&V Report	5 days	Fri 6/24/16	Thu 6/30/16
147	Utility Review and Approval	20 days	Fri 7/1/16	Thu 7/28/16
148	Contract Completion	0 days	Fri 4/28/17	Fri 4/28/17



Project: Co SLO Design Build Sche
Date: Fri 10/16/15

Task	Project Summary	Inactive Milestone	Manual Summary Rollup	Deadline
Split	External Tasks	Inactive Summary	Manual Summary	Progress
Milestone	External Milestone	Manual Task	Start-only	
Summary	Inactive Task	Duration-only	Finish-only	

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8.0 TURN-KEY CONSTRUCTION COST

In addition to the firm fixed cost per ECM as indicated in the Executive Summary, this section provides a preliminary schedule of values for our firm fixed price proposal, which includes all Recommended ECMs for design build implementation.

PG&E SCHEDULE OF VALUES

Line	Task	Value
1	Mobilization (5%)	$226,358
2	Project and Construction Management	$588,531
3	Design	$316,901
4	Installation	
5	ECM 1a Annex Lighting Upgrades	$85,489
6	ECM 1b Old Government Center Lighting Upgrades	$117,436
7	ECM 1c Old Courthouse Lighting Upgrades	$130,865
8	ECM 1d New Government Center (Board Chamber) Lighting Upgrades	$11,590
9	ECM 1f Main Jail Lighting Upgrades	$165,605
10	ECM 1h Honor Farm Lighting Upgrades	$43,770
11	ECM 1i Health Campus Lighting Upgrades	$116,969
12	ECM 1j Health Lab Lighting Upgrades	$12,488
13	ECM 6 Government Center Complex Central Plant Upgrades	$1,201,588
14	ECM 2 & 3 Government Center Complex Variable Flow CHW & HHW	$313,155
15	ECM 7 Health Campus Central Plant Upgrades	$478,034
16	ECM 8 New Government Center Underfloor Air Distribution Upgrades	$130,727
17	ECM 19 Honor Farm Kitchen Hood Controls	$76,307
18	ECM 20a Department of General Services (160 CPUs) Personal Computer EMS	$1,145
19	ECM 20b Planning (212 CPUs) Personal Computer EMS	$1,518
20	ECM 21A Various County Buildings EMCS Expansion	$282,324
21	Startup/ Commissioning/ Training/ Turnover	$135,815
22	Performance Verification	$90,543
	TOTAL	**$4,527,159**

9.0 PERFORMANCE ASSURANCE

PG&E will develop and submit a one-time performance assurance report to the utility to verify the project's savings per the incentive agreement. This report will also be submitted to the County to show/validate the project's energy savings.

Verification of energy savings will be accomplished from a combination of EMS trend reports, outputs from the chiller plant optimization program, run time logger installation and short term power metering. The data collection and analysis effort is required to support procurement of incentives requested through PG&E's custom retrofit program and will provide a valuable confirmation that the implemented measures are generating the expected energy savings reflected in this IGA.

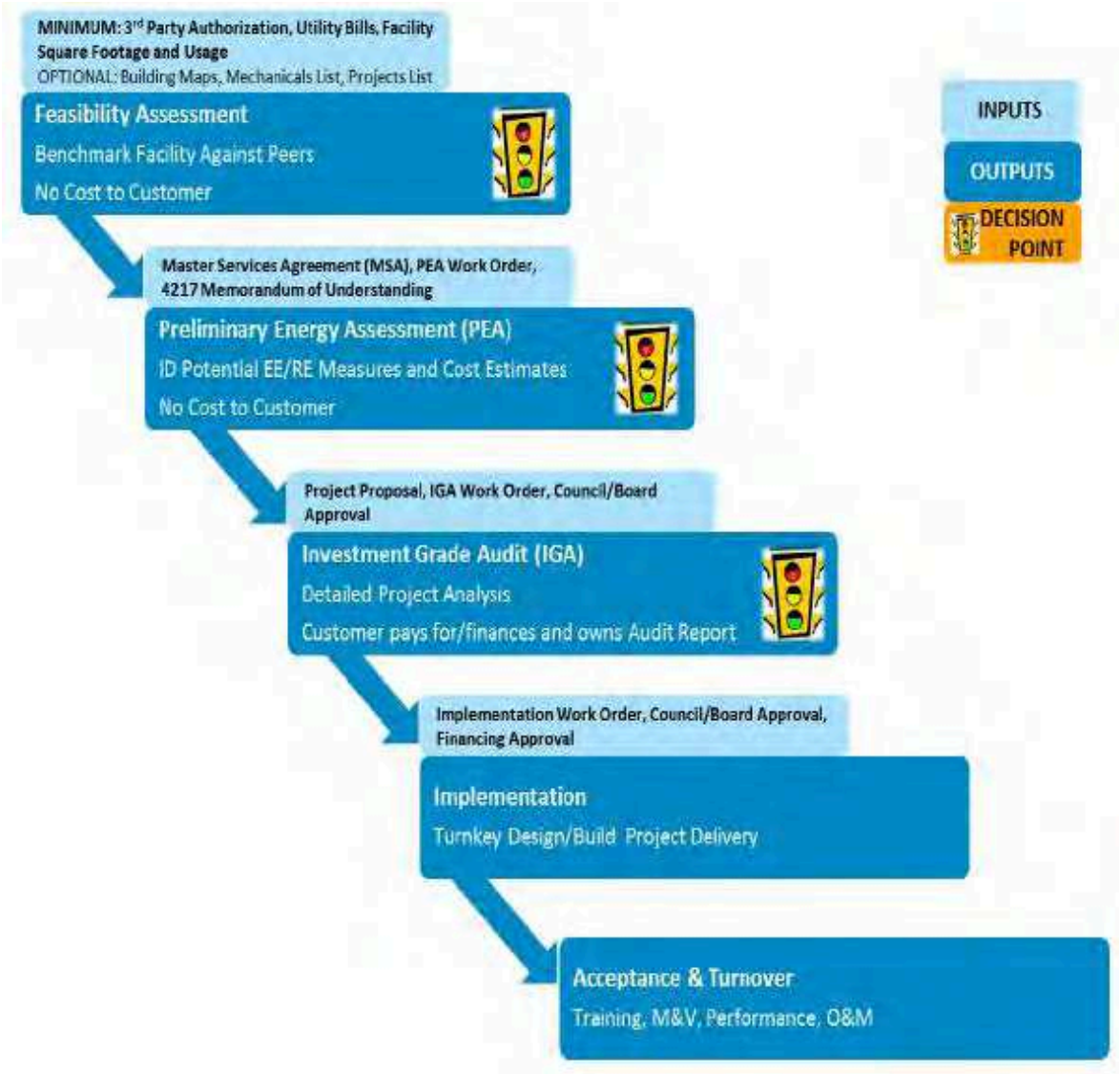
The more complex measures with large energy savings such as the downtown campus central plant upgrade will be verified by continuous monitoring over a period of at least three months. Savings for the simpler measures such as the lighting retrofits will be stipulated based on engineering calculations and verification of installation and commissioning.

10.0 NEXT STEPS

The SST methodology described in Figure 10.1 below facilitates an iterative and collaborative approach that supports the decision making process and is comprised of several steps to ensure the project results in an outcome that meets the County's unique priorities and needs.

PG&E is looking forward to working with the County to make this project a reality. Now that the County has selected the ECMs they would like to move forward with, the PG&E SST team has included in the Final IGA our final project implementation proposal.

Figure 10-1 - SST Methodology



UNIQUE QUALIFICATIONS

PROVEN TRACK RECORD

PG&E has successfully administered, developed, and executed hundreds of millions of dollars' worth of energy efficiency projects.

LOCAL PRESENCE AND LONG TERM PARTNER

With over 100 years' experience in Northern California, PG&E has extensive local resources that will support the project's development, implementation, engineering, and service requirement.

VENDOR NEUTRAL

Since PG&E does not make or sell equipment, we recommend solutions that are in the client's best interest.

ROBUST INTERNAL TECHNICAL RESOURCES

Our energy engineering and project management is delivered by our professional staff and strategic partners.

1. **Feasibility Study (Completed):** Establish available opportunities and project viability through data analysis, interviews and benchmarking.
2. **Preliminary Energy Assessment (Completed)**: Determine technical and financial measures and key opportunities
    - Advance customer's sustainability & climate action goals
    - Reduce utility and operating costs
    - Address again building systems or facility infrastructure
    - Demonstrate a potential project size that fits the SST program
    - Determine potential GHG savings and environmental impact
    - Produce recurring annual savings to support financing
3. **Investment Grade Assessment (Complete)**: Finalize technical solution and financial details
    - Detailed Audit
    - Engineering and Economic Analysis
    - Project Pricing & Financing Plan
    - Monitoring and Verification Plan
    - IGA Report Preparation
4. **Implementation**: Deliver complete design/build construction of project
5. **Acceptance and Turnover**: Final commissioning, training and M&V for all measures

11.0 APPENDICES A, B, C, D, E

Appendix A -- Detailed Lighting Audit Spreadsheets with Scope of Work and Savings

Appendix B -- Lighting Cut Sheets

Appendix C -- Downtown Central Plant ECM, Load Calculations and Savings, Equipment List

Appendix D -- Health Center Central Plant ECM, Load Calculations and Savings. Equipment List

Appendix E – Miscellaneous Savings Calculations